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MEDICAL SERVICE IN MODERN WAR

An exposition of the tactical functions of the Medical Department in Campaign.

With plates

BY

P. S. BOND
Lieutenant Colonel, U. S. Army

AND

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With an introduction by MAJOR GENERAL M. W. IRELAND
Surgeon General, U. S. Army

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Dedication

To the American Medical Profession, in recognition of its splendid services to country and humanity during the World War, this volume is respectfully dedicated.

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INTRODUCTION BY THE SURGEON GENERAL

In the preparation of this volume the authors have produced an admirable exposition of the functions and tactical employment of Medical Department formations and units in campaign. While the text is primarily intended to promote a clearer understanding of the manifold duties and uses of the Sanitary Service of an expeditionary force in the minds of officers of other arms of the service, it will also be found a valuable addition to the libraries of medical officers, and especially to those of the officers' section of the Reserve Corps. All officers will find in its perusal a well arranged and co-ordinated exposition of standardized doctrine which is the resultant of the extensive experience of the Medical Department of the United States Army in the World War.

M. W. IRELAND,
Major General, U. S. Army,
Surgeon General.

War Department,
Office of the Surgeon General,
Washington.
April, 1920.

AUTHORS' INTRODUCTION

The medical, surgical and sanitary service is not alone a humanitarian accessory to ease the suffering and allay the horrors of war. It is active, not passive, and is applied primarily to defeat the enemy. In war the humanitarian function, great as is its importance, is secondary to the tactical function.

The Medical Department is one of the important combatant arms of the service, and should be so regarded. It is not alone a shield and restorative, but a mighty offensive weapon, second in importance to none of the auxiliary arms.

It is the function of the medical department to keep the fighting man in the battle. *He* is the nation's chief reliance, and without him all the other weapons and accessories, guns, tanks, aeroplanes, trucks, ships, are useless.

Lacking the unremitting and intelligent labors of thousands of medical men, the losses in battle would be many times as great as they now are; the largest, most valiant and best equipped army would rapidly melt away from wounds, exposure and disease; and utter defeat and ruin, instead of victory, would be the nation's portion.

In the Civil War there were, in proportion, over three times as many deaths from wounds and disease as in the late conflict although the wounds were, generally, much less severe. Advances in medical science have accordingly resulted in hundreds of thousands of able bodied soldiers being launched in great offensive campaigns against the enemy, who otherwise would have been in the convalescent camps and hospitals, or in their graves.

Thus, plainly, the medical department is an offensive arm, and as such it fights in the very fore-front of the battle, in the zone of machine gun and artillery fire. Practical results and not theories are demanded.

The surgeon with the combatant forces accordingly spends little of his time in hospital buildings. He is in the field; in trenches, shell holes, dugouts, in camp or bivouac, along muddy roads and in wet woods fighting his fight along with the other combatants. He commands troops, directs transportation, organizes and controls tactical movements, supervises construction. He takes

an active part in all the tactical operations of the combatant forces, accompanies them into battle, and is exposed to rifle and artillery fire, poison gas and bombs from aeroplanes. He is not the swivel chair consultant or the white-robed, steam-heated surgeon of peace.

Unless our doctor can adapt himself to these conditions, meet these emergencies, play the game, he is of little use on the field of battle, however skilful in the clinic or the operating room. We can and do utilize the skilful operators in rear of the army, but the combatant surgeon, the man up in front with the fighting troops, must be something more than a surgical operator. He must be an administrator, an organizer, a director, a superintendent, a tactician—in short a *soldier*.

The following pages treat the subject of medical service in war from the above standpoint. They are devoted to the tactical functions of the surgeon in modern war.

The methods herein described are based upon the successful practice of the American and Allied Armies in the World War. The volume has been reviewed and indorsed by a number of the leading medical men in the U. S. Army, who took an active part in the operations of the American Expeditionary Forces in France. It may therefore be regarded as the sound doctrine upon which success in aggressive warfare depends. And that is the only kind of warfare that America contemplates.

A few selected plates have been added to the text, which convey perhaps better than an extended description, an idea of the more important tactical functions, with which all officers of all arms should be familiar.

It is the aim of the authors to present a comprehensive view of the functions of the medical service in their proper relation to the tactical operations of the armed forces as a whole. This comprehensive view is necessary not to medical officers alone. All officers who may be called upon to command troops or perform staff duties should have a thorough understanding of the tactical methods, the powers and limitations of this important auxiliary arm, to the end that it may be utilized to the best possible advantage.

FOREWORD—ARMY ORGANIZATION

The details of tactics, though not its principles, are greatly dependent on the organization employed. In fact organization and tactics have always been regarded as inseparably connected.

Organization varies constantly in the effort to adapt itself to developments in the art of war.

In the United States changes of organization have been made with difficulty, as they usually require legislative action. Accordingly the outbreak of every war has witnessed a more or less violent derangement of the existing organization.

Measures adopted during peace have a natural tendency towards the cumbersome and complex. Under the stress of necessity in war there is a corresponding tendency towards the simple and practical. The useless adjuncts of peace are gradually sloughed off, either with or without a change in the official "tables of organization."

At the close of a war new measures are usually adopted, which are presumed to be based on the experiences of the war. There may even be an attempt, not always successful, to improve on them. There is always the accompanying danger that, with the special experiences of a particular war uppermost in the mind, the need of an elastic organization which can adapt itself to quite different circumstances in the future, may be overlooked. The result of this will be another derangement of the organization on the occasion of the next war following.

Such a sequence of events has been several times witnessed in the United States. On our entry into the World War we adopted an organization which was a compromise between our own ideas and those of our allies. This was modified, in no great degree however, during the war. Plans for reorganization are now in process, and the final outcome cannot be definitely foreseen at the present time.

In view of the evanescent nature of organization it is thought well to base this treatise on the tactics of the medical service upon the organization employed during the late war, which proved itself good and workable, if not perfect.

Since the war a number of changes in this organization have been agreed upon, and they appear to tend towards greater simplicity.

The more important of these changes are as follows. During the war a certain minor proportion of the ambulance and field hospital companies were animal drawn, these being intended to meet situations created by poor roads in forward areas, on which motor transport could not operate. Under the new organization all divisional and higher units will be motorized throughout, including all ambulance and field hospital companies. Each combatant battalion will be provided with a horse drawn wagon to carry its medical equipment. The horses may also be used as pack animals for carrying the equipment where wheeled transport cannot operate. This wagon, when emptied of its load of equipment, may be used as an ambulance. It will take over many of the functions of the former horse drawn ambulances of the divisional ambulance company, including the service of foot troops on the march.

During the war, as described hereinafter, ambulance companies included three sections known as (1) the transportation or ambulance section; (2) the dressing section; and (3) the litter bearer section. Under the new organization the ambulance company will be a transportation unit only, and the functions of the former dressing and litter bearer sections will be performed by a new unit to be known as a "sanitary company." In addition to the foregoing these sanitary companies will perform the duties of policing the battle-field and burying the dead, with the assistance of labor troops if necessary, and will carry out necessary sanitary measures in the divisional area.

The divisional medical service will thus include 4 ambulance companies, 4 field hospital (or hospital) companies, and 4 sanitary companies. Each of these is organized into a battalion, the ambulance battalion, hospital battalion and sanitary battalion. The term "sanitary train" as applied to this organization, is inappropriate. Inasmuch as the divisional medical service performs tactical functions which are more important than its supply functions, it is not properly a "train," whose chief function is supply. The term "divisional sanitary regiment" is more appropriate and more descriptive of its actual function. There will be a regimental commander (in addition to the divisional surgeon) and a commander

for each battalion, known under the old organization as "director of ambulance companies," "director of field hospital companies."

Sanitary companies of the corps, and more especially of the army and service of supply, will be assigned to the duty of maintaining sanitary conditions on a permanent basis in tactical and rear areas. Such companies will perform all the duties of the "sanitary squads" of the former organization.

These, and other less important changes which have been agreed upon, should result in a simplification and better coordination of the work of the medical service.

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GENERAL FUNCTIONS OF MEDICAL DEPARTMENT

The medical department is the conservation and salvage corps for the most important item of the nation's equipment for war—its men. In performing its high function the medical department must, in the first instance, prevent in every possible manner the waste or abuse of this human material by neglect of sanitary and hygienic precautions, in the kitchen, mess hall, barrack or billet, in camp, trench or dugout; and secondly, it must arrange for the prompt collection of the damaged material in the form of sick and wounded, its prompt removal to a place of safety, and its repair and restoration to service as efficiently and expeditiously as possible. The humanitarian instincts which actuate the medical officer are by no means incompatible with this duty, but are in fact an aid thereto. Humanitarian, economic and tactical considerations combine in demanding that the wounded be given, from the instant of injury, such care and treatment as will insure the most complete possible recovery in the shortest possible time.

Troops will fight with much better spirit if they know that an efficient medical service is close at hand from which they will receive, if sick or wounded, prompt and skilful treatment, insuring the maximum probability of their complete and rapid restoration to health and usefulness. Care and attention on the part of officers to the health, the comfort, and even the happiness of the men, earns their esteem and gratitude, and is one of the fundamental requirements of discipline. Such services have, therefore, a great moral, disciplinary and tactical as well as physical and humanitarian value.

The medical department has accordingly two principal functions, the prevention of sickness and disease, and the restoration to health of the sick and wounded.

It is not to be assumed, however, that responsibility for this service rests solely upon the medical department. Commanders of all grades have at least equal responsibility in conserving the health and efficiency of their troops, and in insuring the prompt removal of the wounded from the field of battle. Satisfactory results are obtained only by the fullest co-operation.

A good medical officer may exercise a powerful influence on the health and morale of the command to which he is attached. But if this is to be accomplished he must possess the sympathy and confidence of the troops and the cordial support of the commander. The confidence of the troops is gained by unremitting attention to their welfare, by close personal association and the exercise of tact. The support of the commander is best insured by frequent joint sanitary and medical inspections. The best of medical officers can accomplish little without such support. In the joint inspection the commander sees conditions through the expert eye of the medical officer, and the troops perceive the importance of sanitary and hygienic precautions, and also that their commander takes an interest in them and lends his authority and support.

The average recruit has naturally little sympathy with sanitary and hygienic measures. But he is amenable to reason, and his co-operation can be won if the medical officer has the patience and tact to explain the reasons for things, and insist on their performance without irritating the soldier. He must remember his mission, which consists not only in telling the soldier what to do, but in insuring that he does it. This means that sanitation and hygiene must be made a part of discipline, second nature to the soldier. When the interest and pride of the command has been aroused to such an extent that they are as punctilious in these as in other matters of training and discipline, and not until then, the surgeon may feel that he is fulfilling his mission.

Medical officers should be thoroughly familiar with the best methods of sanitation, and with all approved forms of sanitary devices, such as de-lousers, incinerators, latrines, baths, ovens, chlorinators, etc. They should know how to set up these devices in the field and how to improvise them when regular equipment is lacking.

The medical officer in the field, to be successful in the accomplishment of his mission, must not limit himself to an advisory capacity. He should be a competent and active administrator, able to plan and carry out sanitary measures and projects. It is not enough to merely tell others what to do. The medical officer of a command is a sanitary *director* as well as an *adviser*.

PRECAUTIONARY MEASURES

The careful observance of a few simple precautions and methods will help to avoid a large number of the ills to which the soldier is heir, will maintain him in the highest state of efficiency for the execution of his duties, and in the event of his being wounded will guarantee him a maximum probability of early recovery. On the other hand the neglect of these precautions may easily result in lowering the fighting efficiency of a command 50 per cent or more, or even in utterly destroying its efficiency. This results not alone from men actually lost from preventable sickness, but also from the lowered vitality and morale of those who remain.

In effecting the majority of these precautions the medical officer and commander must co-operate. Chief amongst them are the following:

Air space and ventilation. Insufficient air space in quarters contributes to respiratory diseases and lowered vitality. In all sleeping quarters at least 40 square feet of floor space per man should be provided as soon as practicable. Sleeping quarters should be ventilated during occupancy while avoiding unnecessary draughts, and thoroughly aired out daily during the absence of the inmates. Bedding should be frequently and systematically exposed to light and air.

Sleep. Insufficient sleep is a potent cause of lowered vitality. Troops must be given ample sleep under such favorable conditions as to ventilation, warmth, comfort and quiet as will enable them to derive the maximum benefit from their rest.

Warmth, dryness and comfort. Sleeping quarters should be kept cool and at all times well ventilated, but the men should have sufficient bedding so that they may sleep warm. It is ordinarily undesirable to have fires burning in sleeping quarters during the night, except in bitterly cold or cold and damp weather. A room in which a fire is burning should nevertheless be ventilated.

Warm, comfortable and cheery recreation and reading rooms should be provided, if possible, which insures also that the men do not have to go chilled to bed. A warm place should also be provided for dressing. If a separate room be not available fires in sleeping quarters may be lighted before reveille. When it is necessary to sleep on the ground in damp weather proper drainage and can-

vas shelter should be provided. The men should not be allowed to remain in wet and dirty clothing. Dry, clean clothes, especially socks and shoes, should be provided. Laundries and drying rooms for wet clothing should be available for every organization.

Personal cleanliness. Filth is associated with many diseases. The soldier who is attentive to the cleanliness of his person takes the best insurance against sickness and is usually a well disciplined soldier in every respect. Cleanliness is more a matter of habit than of opportunity. It is essential to self-respect, health, discipline and efficiency. The pride of the men should be stimulated and the necessary facilities provided. Every organization should have some form of bathing facilities, and men should be required to take a bath and put on clean underclothes at least once a week and oftener if possible. At the baths it is well to have a competent enlisted man of the medical department to note the condition of the men's skin and report the names of those who are in need of medical attention.

Vermin. Vermin are the direct or indirect cause of many skin and other diseases. In some cases they have been responsible for more than half the days lost from sickness in a command. They are avoided by bathing and delousing (disinfestation) of clothing, for which facilities should be provided. Men should be deloused at least once a month when practicable.

Flies, mosquitoes and fleas. Flies, mosquitoes and fleas spread disease. Flies are eliminated by the proper disposal of all kitchen garbage, stable and other refuse, especially manure; by scrupulous cleanliness in messes and latrines; and by screening latrines, kitchens and mess halls. Mosquitoes are eliminated by drainage, especially of pools of standing water, by use of oil when drainage is insufficient, and by screening of all buildings used by personnel. Fleas are killed by the use of kerosene oil. Screening will be a last resort in field service. If other measures have been properly carried out it will usually be unnecessary.

Venereal disease. Venereal disease is reduced: by providing comfort and wholesome recreation and entertainment, by frank talks with the men by both the medical officers and commanders, by removing or rendering inaccessible the sources of infection, by providing facilities for prophylaxis and insisting on its use, by weekly physical inspections, and by strict disciplinary measures en-

forced against men who allow themselves to become infected by failure to make use of the prophylaxis provided.

Alcoholic liquors. The excessive use of alcoholic liquors is best prevented by strict supervision of their sale and distribution.

Trench foot. Trench foot is prevented by proper drainage of trenches and campsites, by providing trench boards and sidewalks, by preventing constriction of circulation from tight leggings, by causing the men to change wet shoes and socks at least once a day, and by attention to the condition of their feet and prompt treatment of any cases discovered. Men who have been standing in mud or water should rub their feet from time to time, preferably with a camphorated oily liquid. Commanding officers should see that all their men are provided with two or three pairs of properly fitted shoes and plenty of good socks. They should, by constant inspection, satisfy themselves that the men have the proper facilities and that they are taking proper care of their feet.

Physical inspections. The medical officer, in company with the organization commander, should make occasional close inspections of the persons of the men. This should be done in such a manner as not to offend their self respect. At these inspections the medical officer notes the general health of the man, his habits as to personal cleanliness, examines his skin, mouth and throat, private parts, feet, etc., and questions him as to his condition. Many soldiers have a great reluctance to report themselves sick.

Isolation of communicable disease. All men found to be suffering from communicable disease should be promptly isolated and their comrades in contact with them should be separated from the rest of the troops until it is certain they are no longer possible "carriers" of the disease. Any suspected cases of communicable disease should be isolated and kept under observation until such time as found to be negative. When necessary, clothing should be sterilized and quarters disinfected. A very close watch must be maintained and prompt measures taken for the suppression of any disease which might become epidemic.

Anti-gas protection. The regulations concerning individual and collective measures for protection against poison gas should be enforced, by constant inspection, drill and alarms.

Messing. Good food, properly prepared and served, is vitally necessary to good health and good discipline. Supervision of messing arrangements is a most important duty of both medical and line officers, and they must co-operate in securing results. Constant inspections of kitchen and mess should be made. At these inspections officers should insist on scrupulous cleanliness and order of personnel and equipment. Cooks, especially, should be scrupulously clean and neat in person and attire. Officers see that the food is properly cooked and served without waste, and that no spoiled food is used. They see that the food is stored in clean receptacles and protected from flies. They see that the men's kits are thoroughly cleansed and sterilized in boiling water after meals. At each mess there should be provided for this purpose at least 3 large cans of water, the first to contain soapy water, the last to be clean water, and all kept boiling. Constant interest and attention on the part of officers stimulates the cooks and other personnel to put forth their best efforts.

The number of calories in the food is not more important than the manner in which it is served and the conditions under which it is eaten. Food should be served hot, and appetizing, in a comfortable and cheerful room when possible. Even under the most trying conditions some form of shelter should be provided for the men while eating, and tables or stands on which they can place their mess kits.

Water. Water for drinking purposes should be sterilized by chlorination, and an organization should never be without the equipment necessary for this purpose. In emergency, water may be boiled. Officers should see that men are provided at all times and under all circumstances with potable water that they may have no reason for drinking any that is not. When access to sterilized water is impossible the contents of a hypochlorite tube for sterilizing the water in a lyster bag may be dissolved in the canteens of some reliable non-commissioned officers, who can sterilize the contents of other canteens by pouring into them about a teaspoonful of the sterilized water.

First aid. All officers and enlisted men should be instructed in simple first aid in case of ordinary sickness or wounds, especially the dressing of wounds to protect them from infection.

Biologics (Vaccines). The biologics required by regulations are to be systematically administered, and accurate records kept. The principal biologics are those for the prevention of typhoid fever, small pox and tetanus. (The last named is a *serum.*)

Permanent sanitary personnel in tactical areas. Divisions and corps frequently change their positions under the stress of campaign, and in accordance with tactical and strategical requirements. Troops are being constantly relieved, and their places taken by new troops. In every case the medical personnel attached to the organizations must move with them. If a new sanitary régime assumes control of an area every time there is a movement of troops into the area, effective sanitary control becomes very difficult. There is a lack of continuity, plans cannot be carried out, some work will be duplicated while other necessary measures are neglected.

These difficulties are avoided by organizing the sanitation on an area basis, with *army* (as distinguished from corps or division) sanitary officers and troops permanently assigned to the areas. This assures continuity in the prosecution of sanitary measures. To properly supervise sanitation in an area a medical officer must be constantly in that area. The medical troops of organizations coming in find policy and control established. They are instructed as to local conditions by the local sanitary authorities, and work in conjunction with the latter during the time that their organization occupies the area.

Under the new organization sanitation of areas is provided for by assigning sanitary companies to sections of the army service zone, under the command of army or army group commanders. Such troops will be under the immediate orders of the director of army service.

Maintenance of sanitary conditions. A sufficient number of latrines should always be provided. They should be fly-proof, emptied or burned out regularly, and kept clean. In the front lines, when the troops are in trenches and where latrines cannot be used, tight cans, to be emptied at night are provided. In open warfare where movement is rapid, the straddle trench is employed. Flies must always be excluded from contact with excreta. Kitchen waste should be kept in clean, tight, metal receptacles, when practicable, and not allowed to accumulate. The accumulation of unsightly

and unsanitary heaps of waste matter of any kind should be prevented. Flies are avoided by making latrines fly-proof, by burying dead animals, by disposing of refuse, by keeping food and waste covered, and mess kits and kitchen utensils clean. Incineration is the best means of disposing of feces and waste, except when the troops are on the march. If it is properly done very little fuel, in addition to the waste products, is required. Liquid garbage is disposed of by means of soakage pits. Solid garbage may be burned, buried, or fed to hogs. Efficient and positive drainage should be provided for all trenches and occupied areas.

The men should not be allowed to entertain the idea that under war conditions filth can be or must be tolerated. Filth is more dangerous in war than in peace. Every locality occupied by troops, under whatever discouraging conditions, should be cleansed and beautified to the utmost possible. Clean and beautiful surroundings are not a useless refinement. They have a high tactical value. They promote health and happiness, and with them self-respect, morale, and *fighting efficiency*. The man who lives amongst clean and beautiful surroundings naturally and justly considers himself superior to one who willingly lives in filth and squalor, and *the sense of superiority wins battles*. Cleanliness and neatness are worth all they cost, and more, and are the surest index of the state of discipline and efficiency of a command. The organization whose camp, billets or trenches are clean, sanitary and *attractive*, under whatever conditions, is *always* a good organization, and one to be depended upon in any emergency. To instill this spirit of pride into the men is one of the chief duties of the medical and line officers, working in co-operation. Even the naturally dirty and careless man hesitates to spit on a clean floor or befoul an attractive billet, especially one he has himself beautified. On the other hand filth and neglect breed more of the same kind, encourage carelessness and indifference, and lower the self-respect, pride and *fighting efficiency* of the organization which permits and countenances them. The promulgation of sanitary rules and regulations is alone of little use. Their thorough enforcement is the aim, and this is impossible unless the pride of the men has been aroused.

The maintenance of sanitary conditions in all areas occupied by troops may accordingly be summed up in one word, cleanliness.

Evacuation and care of the wounded. Experience proves that a large proportion of deaths and disability is caused by the infection of wounds, and that the wounds received in modern warfare are especially liable to infection. This infection results when the wounded are left without surgical attention in a condition of lowered vitality for too long a period. Accordingly they must be promptly removed from the field and their vitality restored by placing them under shelter and giving them comfort, rest, warmth, and refreshment. The seriously wounded should be placed in a surgical hospital in a condition to undergo an operation as soon as possible, usually within 6 hours and in no case more than 12 to 18 hours from the receipt of their wounds. Unless this is accomplished the wounded are liable to suffer death or serious disability. A wounded man is still an asset to his country, but if unnecessarily left neglected in a condition of lowered vitality he soon becomes a loss for which the commander and medical officer who have failed to perform their duty in this respect are directly responsible.

The prompt collection of the wounded and the restoration and maintenance of their vitality in order to prepare them to undergo transportation and surgical treatment, is the special function of the medical department personnel attached to organizations. The more important measures taken to insure recovery include: prompt removal from the field, dressing of wounds, checking dangerous hemorrhages, application of splints to fractured bones, morphia to relieve pain, anti-shock treatment (which includes heat, comfort, shelter, hot food and drink), anti-tetanic vaccine and avoidance of unnecessary disturbance of the patient during evacuation.

While the desperately wounded demand, and should receive prompt attention, it is to be borne in mind that from the point of view of the state the slightly wounded man, who can be rendered fit for duty in a shorter time, is the more valuable asset. His chances of recovery must not be jeopardized nor the date thereof unduly postponed by failure to give him prompt attention. Minor cases, if neglected, frequently become serious and incurable.

SANITARY EQUIPMENT OF MEDICAL DEPARTMENT WITH DIVISION, CORPS AND ARMY

DIVISIONAL SANITARY TRAIN

The sanitary train (formerly so called) of a division comprises all personnel and equipment belonging or attached to the division, except that which is directly assigned to regiments and battalions. Its principal items, according to the war organization are:

4 ambulance companies, 3 motorized, 1 animal drawn.
4 field hospital companies, 3 motorized, 1 animal drawn.
1 divisional laboratory.
1 medical supply unit, motorized.

Additional equipment may be attached if needed.

The medical equipment of the division is designed to meet the needs of the division in combat and should generally do so if kept intact and in good order, and efficiently handled. When in case of great stress, accident or emergency it becomes necessary to reinforce it this is accomplished by the employment of corps, army or reserve division units.

The division in combat, however, is responsible for the evacuation of wounded only as far back as its own field hospitals. Its ambulances should not be sent farther to the rear and perhaps lost to the division at a time when they are needed at the front. The evacuation of wounded to the rear of the divisional field hospitals is not the duty of the divisional medical personnel or transportation when there is work to be done at the front. Divisional ambulances are occasionally so employed, however, when this does not interfere with their proper duty, as in periods of calm in a stabilized sector.

The transport of reserve divisions may be employed in emergency to assist in evacuation in rear of the first line divisions, but when a reserve division is sent into line its equipment should be intact under the control of the division surgeon.

When a second line division passes through a division in the first line the medical units already in place continue to function until such time as their relief is ordered. In case of an advance the units of the relieving division establish the new forward stations.

Medical supply unit. This is a motorized reserve of medical and surgical supplies for the replenishment of the sanitary train and organizations of the division. On the march it is with the sanitary train, subject to the call of the division surgeon in case of need. In action it establishes issue points at such localities as indicated by the division surgeon, or prescribed in operation orders.

Depots and dumps. Depots and dumps of medical supplies are established as needed in armies and corps, on the same basis as for other classes of supplies. Each army establishes an army depot and each corps a corps park. Issues are made direct from corps parks, or dumps established, according to circumstances.

SANITARY TRAINS OF CORPS AND ARMY

The sanitary train of an army corps (war organization) includes:

4 ambulance companies, motorized
4 field hospital companies, motorized.

The sanitary equipment of an army (war organization) includes:

4 ambulance companies, motorized
4 field hospital companies, motorized
16 evacuation ambulance companies, motorized
4 mobile hospitals
1 army medical supply depot
evacuation hospitals

(The allowance of evacuation hospitals was two for each division in the army, but this was never attained.)

This equipment (corps and army) is not fixed, but assigned according to the strength of the organizations or other circumstances. These units are used for the service of corps and army troops, and for the evacuation and care of the sick and wounded in rear of the divisional field hospitals, or for reinforcing or relieving divisional units in times of stress. Corps medical units, while intended primarily for the care of corps troops, may also be utilized to meet emergencies.

Mobile hospitals. These are a part of the reserve equipment of the army and are assigned as needed to divisions in the first line

to reinforce the division triage (sorting station), and as advanced field hospitals for non-transportables, working in conjunction with field hospitals. They have a tentage capacity of 250 patients, which may be increased if buildings or additional tents are available. It will usually be advantageous, therefore, to establish them in a village. These hospitals should be as mobile as a field hospital.

The foregoing are the principal items of equipment. Other items are, or may be included, or added from time to time as necessity demands (mobile laboratories, mobile surgical units, mobile de-gassing units, camp infirmaries, etc.)

Light motor ambulances are not habitually a part of the divisional equipment, but are usually assigned to divisions in line when needed. They are most useful in the forward zones of evacuation, especially in transporting patients between battalion aid stations and ambulance head, where litter carry might otherwise be necessary.

MEDICAL DEPARTMENT PERSONNEL

The personnel of the medical service with combatant troops is classified in two general groups.

First—Those attached to organizations smaller than a division, who function under the immediate orders of the organization commander and accompany the organization on the march and in combat.

Second—Those attached to the sanitary trains who function under the immediate orders of division, corps and army surgeons in accordance with the general instructions of the division, corps and army commanders.

Attached medical troops. The medical personnel attached to a regiment includes medical officers, dental surgeons and enlisted assistants. The senior medical officer is called the regimental surgeon. This personnel is assigned in part to battalions by authority of the regimental commander. The regimental medical personnel remains at all times with the organization, performing all medical, sanitary or dental service required. The medical equipment of the regimental medical personnel is transported on the combat trains of the regiment and in carts or light wagons.

The enlisted personnel of the regimental medical detachment perform during combat the duties of assistants to the medical officers, and serve as dressers and litter bearers in the forward zone. There should be at least two dressers for each combatant company, specially trained men who can apply simple dressings and splints and check hemorrhages. The litter bearers of attached personnel transport the wounded no farther to the rear than the aid station or designated collecting point. If further carry by litter is necessary it is performed by the bearer section of the ambulance company, or by the "sanitary companies" of the new organization. In each combatant company there should be also a number of men, at least eight, who have been specially selected and trained as litter bearers and in the administration of simple first aid. In case of necessity the regimental and battalion surgeon may call for the detail of these men.

EVACUATION AND TREATMENT OF SICK AND WOUNDED

The system of evacuation of the medical department aims to remove all sick and wounded to the proper medical department station where they can receive such attention as their condition demands, in time to insure their ultimate recovery and reduce their convalescence to the shortest possible period. Experience indicates that the shorter the time of evacuation, the greater the chance of recovery, provided the vitality of the patient is maintained during transport.

This evacuation is accomplished by a series of relays between stations progressively better equipped, and consequently less mobile, from front to rear. At the forward stations the wounded receive only such attention as necessary to insure their safe transport and arrival in proper condition at the stations in rear, where complete treatment is administered.

The treatment at the forward stations depends accordingly on the condition of the patient. The desperately wounded, who are in no condition to undergo a long journey, but require immediate surgical treatment, are operated upon at the forward surgical stations (mobile hospitals). Their number ordinarily does not exceed one per cent of all wounded. Those who can endure the jour-

ney are given preliminary treatment only at the forward stations, and evacuated promptly to the surgical stations in rear, which have greater capacity and better facilities for the treatment and subsequent care of the wounded.

At each station the sick and wounded are sorted according to the nature and degree of their disability, the nature and urgency of the treatment to be administered, and the class of transportation required; and are then distributed to the stations in rear.

The number, class and distribution of stations vary considerably with the tactical situation, the number of casualities to be handled and the transportation facilities. In periods of calm the number and capacity of stations may be greatly reduced and some may be dispensed with altogether. In times of stress it may be necessary to reinforce the facilities of all stations as well as the means of transportation between them. In any case the stations, and especially the mobile forward stations, should not be established unless it is quite evident that they are actually required. Prior to this a number of them are held in reserve, mobilized, to meet emergencies.

NUMBER AND CLASSIFICATION OF CASUALTIES

The following approximate figures, based on the experience of the European war, will serve as a guide in estimating the number and classifications of casualties to be expected under various conditions.

The casualties resulting from a day of battle may run as high as 20 per cent. A division which has lost 25 per cent of its effectives should generally be relieved from the first line.

These casualties under such conditions as obtained during the late war, may be very roughly classified as follows:

Dead,	15%
Gassed, sick and exhausted,	35%
Seriously or moderately wounded,	15%
Slightly wounded,	35%
	100%

A slightly wounded man is one who has no injury to an important organ or large joint, no fracture of femur or humerus,

nor injury to the skull. Any penetrating wound of the trunk is classed as serious.

The more open the tactical operations, and the less the part played by the artillery, the less, as a rule, will be the number of serious casualties and the smaller the proportion of dead. Wounds resulting from artillery fire are more serious than those resulting from rifle fire.

During a year of active operations the casualties of a combatant organization may reach 70% of its total strength, exceptionally more.

As to requirements for transportation, the casualties (excluding dead) may be roughly classified as follows:

Able to walk to battalion aid station, with or without assistance,	40%
Requiring transportation sitting,	40%
Requiring transportation recumbent,	20%
	100%

In the evacuation from the field hospitals to the rear the transportation requirements will be about as follows:

Requiring transportation sitting,	60%
Requiring transportation recumbent,	40%
	100%

From 65% to 85% of the patients will eventually return to full duty. The foregoing figures are averages only, and may vary considerably in any given case.

(See Appendix "A," for additional statistics of battle casualties.)

SORTING OF CASUALTIES

At every station at which casualties are received and from which they are evacuated, they are sorted according to the treatment to be administered and the disposition to be made of them. The purposes of this sorting (triage) process are as follows:

(a) To separate malingerers from bona-fide cases of sickness or injury.

(b) To separate arriving cases that are to be retained temporarily at the station in question for rest, recuperation or treat-

ment, from those which are to be evacuated at once to stations in rear, or returned to the front.

(c) To classify the cases retained at the station according to the nature, extent and urgency of the treatment to be administered.

(d) To classify the cases to be sent to the rear at any time according to the nature of their disability, (sick, gassed, wounds of different classes); according to degree of injury and urgency of treatment required, (slightly, seriously or desperately wounded); and according to the class of transportation required, (walking, with or without assistance, in ambulance, sitting or recumbent.)

(e) To determine, at frequent intervals, the further disposition of cases on hand at the station, (further rest, treatment or recuperation, evacuation to stations in rear, return to the front), with a view to proper treatment of cases and clearing the station for forward movement or the reception of fresh cases.

Not all of these classifications are, of course, either necessary or possible at every station.

Sorting of casualties is thus a continuous process at all stations on the route of evacuation, varying in its application and extent according to the special function of the station, and the tactical situation of the moment. A team of litter bearers, finding two wounded men, select for immediate removal the one who, according to their judgment, more urgently requires relief.

At the important stations medical officers classify the casualties as to nature and urgency of treatment required.

At battalion (or regimental) aid stations all cases are provisionally diagnosed when possible and tagged. The diagnosis tag includes a brief statement of the treatment administered to the patient at the aid station (anti-tetanic, morphia, etc.) These tags serve as passes for the walking wounded. Cases requiring attention at ambulance head, before being sent to the triage, are indicated.

All casualties coming from the front, pass through ambulance head. During periods of relative calm it is here decided to which of the various field or evacuation hospitals the patients are to be sent, especially when these hospitals are not grouped, in which case confusion and dangerous delays may result if the sorting is carelessly done and patients sent to the wrong stations.

The sorting is greatly facilitated if the cases have been correctly tagged at the aid station.

In times of activity in open warfare there will be little opportunity for the thorough sorting of casualties at either battalion aid stations, or ambulance head. In such situations each division in the first line establishes a field hospital as a triage, from 3 to 5 miles from the front. All casualties of whatever nature coming from the front are here carefully diagnosed by field hospital personnel and the division consultants, and distributed to the various field and evacuation hospitals, according to the nature and urgency of the treatment required. In periods of calm in a stabilized sector, when the number of casualties is not great, no triage is required.

The extent to which sorting can be done at stations in advance of the triage depends upon the tactical situation, the rapidity of movement and number of casualties. In periods of relative calm in a stabilized sector the casualties can be more accurately diagnosed at battalion aid stations and sorted at ambulance head, which facilitates their subsequent evacuation. In periods of activity when the number of casualties is large it will be impossible to sort them except at the triage. Evacuation hospitals establish a triage whose function is the same as that of the divisional triage.

If sorting at other stations has been properly done no hospital should receive any sick or wounded who should have been sent elsewhere.

At the evacuation hospitals the sick and wounded are sorted into those requiring treatment thereat and those who must be transported to the army convalescent depot or to the base hospitals. Cases to be retained are sorted according to the nature of their disability. Convalescent cases are evacuated to the army convalescent depot or to base convalescent camps.

At all operative stations cases are sorted into those for operation and those requiring pre-operative treatment. The former are classified according to urgency of treatment.

At all stations men who are able at any time to return to the front are turned over to the provost marshal or replacement depots.

Each hospital keeps records of the cases passing through it and renders reports as required by the division surgeon or higher authorities.

FIRST AID AND PRELIMINARY TREATMENT

The chances of recovery of the wounded are greatly increased and the period of convalescence reduced if their vitality is maintained by preliminary treatment promptly administered as soon as possible after their fall. Such treatment checks or delays the ebb of vitality and saves many lives.

First aid is provided for by detailing about two men from the attached sanitary troops to each company in the first line. As it is often not possible to transport the wounded at once to an aid station (sometimes not until the next period of darkness) first aid in the field, in the matter of applying splints and dressings, is of the greatest importance. A few medical personnel should accompany raiding parties. The troops should also be instructed in simple first aid including the application of simple dressings so that the wounded and their comrades may alleviate their own condition to some extent.

At each station on the route of evacuation the wounded are given such comforts and treatment as necessary to alleviate their suffering and restore or maintain their vitality. This preliminary treatment in the field and at stations en route includes:

First aid. Dressings, bandages, checking of hemorrhage.

Anti-shock treatment.

Morphia.

Application of splints.

Anti-tetanic serum.

Hot food, drinks and stimulants (if indicated)

Administration of oxygen (to gassed cases)

Warmth, shelter, quiet and rest at stations and as far as possible during transport. It is especially necessary that shock be combatted by keeping the patients hot (with blankets and hot water bottles) during transport.

Non-disturbance. A patient having been placed in the most comfortable position upon a litter with his limbs properly disposed and body covered should not thereafter be removed from the litter or otherwise disturbed until placed on the operating table. Dressings should not be renewed or even readjusted unless actually necessary, blankets should not be changed.

ZONES OF EVACUATION

The area covered by evacuation may be divided into zones roughly parallel to the front, according to the nature of the transportation employed and the organizations controlling such transportation. (See Plate II.)

The first zone extends from the front line to the battalion (or regimental) aid stations. This zone is subject to intense hostile fire from all weapons. Transportation is usually by means of litter, under control of the medical personnel attached to battalions and regiments. Other means of transport are utilized when possible.

The second zone extends from the battalion (or regimental) aid stations to the field hospitals. The usual means of transportation in this zone are ordinary litters, wheeled litters or light ambulance (animal or motor) from battalion aid stations to ambulance head (unless conditions permit the standard ambulances to reach the aid stations direct), and motor ambulance from ambulance head to the triage or field hospitals. This transportation all belongs to or is under control of the ambulance companies of the division.

The third zone extends from the divisional field hospitals to the evacuation hospitals. The usual means of transportation in this zone are evacuation ambulance companies (army units). In periods of relative calm, however, ambulances of the divisional ambulance companies may occasionally transport wounded to the evacuation hospitals direct from ambulance head. The ambulances should be promptly returned to the division. In this case the third zone may be merged with the second, the surgical field hospitals being in reserve.

The fourth zone extends from the evacuation hospitals to the base. The carriers in this zone are railroad or vessel under control of the line of communications (service of supply).

The stations at which the sick and wounded of combatant organizations are transferred to the line of communications for transportation to base hospitals, are termed evacuation points. These evacuation points are of course at or near railheads and ordinarily at a group of evacuation hospitals.

In any of these zones alternative or additional methods of transportation may be employed. In the advanced zones light

railways and canals are utilized when practicable. In all zones any available means of transportation, moving to the rear, such as empty motor trucks, should be utilized if necessary for the evacuation of the wounded, and to this end the medical authorities should establish liaison with those controlling such transportation.

MEANS OF TRANSPORTATION

The transportation of the divisional sanitary train is designed to meet battle conditions, but in times of emergency every available means of transport is pressed into the service of evacuation.

Division surgeons should keep in touch with the staff, and officers controlling animal and motor transport, and secure from them extra transportation as needed. Empty vehicles of all kinds returning from the front may be used, if necessary, to transport sick and wounded, usually the less severe cases, urgent cases being sent by ambulance. Such light railways as are available in the forward areas may also be employed. The division surgeon has at his disposal all motor transport of the divisional sanitary train.

When canals are available canal barges are used for evacuation. They form floating hospitals where excellent conditions for the care of the wounded may be realized.

The service of supply has at its disposal an equipment which includes ambulance companies, motor trucks, hospital trains and boats, which take over the casualties as promptly as possible from the evacuation hospitals.

When forward roads are in very poor condition (as will often be the case) the horse drawn ambulances, the medical wagons attached to battalions (new organization), or light motor ambulances should be used in the forward areas and standard motor ambulances on the better roads in rear. The former allotment of animal drawn units was provided expressly to meet such situations.

The personnel and equipment of attached medical troops and of divisional medical units should not be employed, except in emergency, for the transportation of wounded, beyond their normal zones of action. Thus battalion litter bearers transport wounded only as far as the battalion aid station, whence they return to the front. Divisional ambulance companies as a rule transport wounded only as far as the triage or group of divisional field hospitals.

Capacities of carriers. The capacities of the vehicles usually employed are as follows:

Vehicle	*Sitting*		*Recumbent*
3 ton truck	20	or	12
Ambulance, heavy. (animal or motor)	9 (one on seat with driver)	or	4
Ambulance, light motor	6	or	3

In assigning patients to ambulances they should as far as practicable be classified—all wounded or sick or all gassed in any one ambulance.

Litter transport. Wounded unable to walk are transported by litter from the places where they fall to the company collecting posts and battalion aid stations. Other means of transportation are of course employed whenever practicable. When it is impossible to send even light ambulances or wagons to the battalion aid stations patients must be carried by litter from these stations to ambulance head, or to the nearest point which can be reached by ambulance. The zone of transport by litter should in any case be made as shallow as possible, since this method is very slow and arduous. This is accomplished by pushing wheeled transport as far to the front as possible, by using wheeled litters if available, and by employing vehicles of any kind moving to the rear. Every effort should be made to remove the wounded from the field even in the face of heavy fire, but it will often be necessary to wait until dark before this can be accomplished. Under cover of darkness wheeled transport may often be pushed farther to the front than would be practicable in daylight. Where the condition of the patients permit such a delay, this will greatly reduce the burden of litter transport.

For very short carries two litter bearers may be sufficient. Ordinarily four bearers will be necessary. Where the depth of the zone of litter transport is considerable, relay stations should be established at intervals of from 600 to 1,000 yards according to the nature of the route and the exposure. Relay stations should be sheltered and concealed from observation and fire. In a stabilized sector dugouts or concrete shelters may be provided, or cellars utilized. There should be sufficient capacity to shelter at least one litter squad of four men in addition to ten or twelve wounded.

These stations should be in charge of a non-commissioned officer who regulates the relays of litter bearers.

In emergency, additional litter bearers may be drawn from the combatant troops or labor units, and prisoners moving to the rear may thus be employed. During an action no combatant, not specially designated by his commanding officer, is permitted under any circumstances to accompany wounded to the rear. Men thus designated on request of medical officers, should wear some mark distinguishable at short distance only, as a provision against skulking. It is to be remembered that the most important duty of the medical personnel is to collect the wounded and administer first aid—dressings and splints. If the number of wounded and the distance they must be litter-borne is such that the attached medical personnel cannot properly perform all these functions, additional litter bearers must be provided from the divisional medical personnel, the combatant troops or other source.

A wounded man having once been placed on a litter should not thereafter be removed from it nor subjected to any other unnecessary disturbance. The litters are placed in the ambulances without removing the wounded.

Walking cases. All wounded who are able to walk may be required to do so if transport is not readily available. To prevent straggling, walking wounded should be assembled in groups at the various stations and sent back under charge of wounded officers or non-commissioned officers.

Gas cases. Bona-fide gas cases should not be permitted to walk, but should be transported in a recumbent position if practicable. Exertion after being gassed is dangerous. The medical officer should satisfy himself that the men are not shamming. Gas cases should not be transported in the same trucks or ambulances as the sick and wounded if it can be avoided, nor should trucks which have been used for gas cases be subsequently employed for sick and wounded, until washed out with soda solution.

ROUTES OF EVACUATION

In periods of relative calm in stabilized sectors the wounded in the advanced zone are evacuated to the aid stations through approach trenches designated for the purpose. During an action if the number of wounded is considerable it will probably be

impracticable to evacuate them all through the trenches. In this case the litter bearers must move over ground and the safest and most practicable routes must be selected in advance. In open warfare the routes having the best natural shelter and concealment are selected.

The operation of the evacuation of the wounded should be conducted in such a manner as not to interfere with the tactical movements of troops or transport. Accordingly separate routes should be provided for evacuations where it is practicable to do so. Otherwise scheduled times may be prescribed to prevent interference of traffic moving to the rear with that moving to the front, and between animal drawn and motor transport. These matters are the function of the staff. The division surgeons should make a careful study of the available routes and distribute their stations and transport to the best advantage.

The routes of evacuation should be plainly marked with signs (visible by night) at important road junctions. Military police should be instructed as to the location of medical stations so that they may direct the wounded and ambulances.

AMBULANCE COMPANIES

The function of the ambulance companies is the transportation of wounded, by litter and light or standard ambulance, in the second zone of evacuation from the battalion aid station to the triage or field hospitals. They also establish ambulance heads (and collecting stations) and, in an emergency, the triage. The four ambulance companies of a division are under the control of a director of ambulance companies.

An ambulance company includes 12 ambulances. Those of the division are ordinarily of the standard, heavy type. Companies of light ambulances may be assigned to divisions when circumstances require, the army having a reserve of light ambulances for such use. Evacuation (army) ambulance companies are always of the standard type. Ambulances of different types are not combined in one company.

There are four ambulance companies to a division, the same as the number of infantry regiments. Each has from 12 to 20 teams of litter bearers who, in emergency, may be reinforced by personnel from other medical units, labor or reserve troops, or

prisoners. There should be an ample supply of litters so that the wounded may be sent through to the evacuation hospitals on the same litters. In action the company has three sections, (1) the transportation or ambulance section; (2) the litter bearer section; and (3) the dressing section.

NOTE: The foregoing is the organization in use during the war. Under the new organization ambulance companies have no function except transportation, the other duties mentioned above being performed by the new sanitary companies. Under the new organization each ambulance company includes 20 ambulances instead of 12.

EVACUATION IN THE ZONE OF THE SERVICE OF SUPPLY

Evacuable patients are held in evacuation hospitals no longer than is necessary to sort them and put them in condition to bear further evacuation to the rear without undue risk, or to return them to army convalescent depots or to the front, if the period of their disability is to be short. These hospitals are evacuated by train, boat, and exceptionally truck. Where hospital trains or hospital ships are insufficient or lacking, ordinary rolling stock is used (passenger and box cars). This was often the situation in France, where there was a great shortage of rolling stock. In the U. S. properly equipped hospital trains in sufficient number would be available. In any case a kitchen car should be attached so that the wounded may be fed en route, even if it be necessary to stop in order to do so. When properly equipped trains cannot be provided, rest stations, having an infirmary section, dressing section and messing section, are established at suitable intervals along the line of travel.

Patients sorted at the evacuation hospital, are distributed according to malady, wound and condition to special hospitals for nervous diseases, skin diseases, diseases of the eyes, contagious diseases, etc., or to convalescent and rest camps for special treatment or training. Hospitalization in the service of supply requires a bed capacity equal to about 12% of the forces engaged. No cases are sent to the zone of the interior except those liable to be of very long duration or permanently disabled.

MEDICAL STATIONS ON THE ROUTE OF EVACUATION

The route of evacuation will include some or all of the following stations, in order, from front to rear:

a. Company aid posts.
b. Battalion aid stations, (or regimental aid stations).
c. Ambulance head.
d. The triage. (Advanced field hospital and mobile hospital.)
e. Other field hospitals.
f. Evacuation hospitals.
g. Army and base hospitals.

Company aid posts. Local aid or collecting posts may be established in splinter-proofs or with the best shelter available, to cover the position occupied by each first line company. These are characteristic of stabilized warfare but may be employed also in more open operations. In trench warfare they should be sufficiently capacious to shelter a litter squad of four men and several patients and are usually placed just off the approach trench designated for evacuation.

BATTALION AID STATIONS

The battalion aid station is the first organized post on the line of evacuation of the wounded in time of battle. In preparation for combat, or when required by the number of wounded, one or more such stations are established for each infantry battalion in the first line and for artillery and engineer units, etc., as required.

Here the wounded of the battalion are assembled from the field or the company aid posts, and given such preliminary treatment as will enable them to endure the journey to the rear, and insure as far as possible their arrival at a surgical station in fit condition for immediate operation.

Aid stations are established by the medical personnel attached to battalions at such times and places as may be designated by the battalion commander after consultation with the surgeon.

During periods of comparative calm or when not in the presence of the enemy, battalion aid stations serve as infirmaries.

Location. The location of the station will depend to some extent on the terrain, the roads, communication trenches, and natu-

ral shelter available. It should be nearly opposite the center of the battalion or so located as to intercept the natural drift of wounded to the rear. It should be close enough to the front line to promptly receive the wounded, but not so close as to be involved in the movements of the line, nor unduly subject to fire directed thereat, which would interfere with its functions and the movement of the wounded. According to circumstances this distance varies from about 300 to about 1,200 yards. The station should always be as close to the front as is safe and convenient, but not in the vicinity of artillery positions or anything else that will draw fire.

Shelter from observation and fire, both for the station and the lines of approach thereto, is very necessary. Advantage will be taken of any shelter afforded by the terrain, such as reverse slopes of hills, large woods, and areas subject to heavy fire will be avoided as far as possible. The station will accordingly be established when practicable under natural shelter or in a dugout or bombproof cellar of sufficient size to provide a space for two officers, and for dressings and supplies, quarters for four soldiers of the medical service, and space for at least four recumbent and eight sitting patients. There should be easy ingress and egress for litters.

The station should have convenient approaches, sheltered from observation and fire, for litter bearers, and if practicable for ambulances. It should be near a road, but not immediately next to an important road apt to be shelled. In an organized position it should be near the principal communicating trench assigned for the evacuation of wounded.

The location of the battalion aid post should be plainly indicated by sign boards at important points, and if necessary guides are posted to direct wounded or litter bearers to the post.

The station should be in close liaison with the battalion post of command and may be in the same vicinity. But it should not be placed so close as to interfere with the command.

Treatment of wounded. The treatment given the wounded at battalion aid stations includes so much of the following as may be necessary before they are evacuated:

Application of dressings to wounds and splints to fractures.

Checking hemorrhages.

Anti-shock treatment, which includes shelter, rest, sleep, heat, hot food and drink, morphia to allay pain, etc.
Exchanging wet or gas impregnated apparel, when necessary and practicable.
Administration of anti-tetanic serum.

The purpose of this treatment is to restore or maintain the vitality of the patients. The treatment of shock is most important, and if efficiently done will save many lives. Such treatment is often preventive rather than curative as shock usually develops an hour or more after the receipt of the wound.

The wounded are diagnosed and tagged. Walking wounded are sent to the ambulance head or the triage in groups under wounded officers or non-commissioned officers. Those unable to walk are evacuated, when ready, to ambulance head by hand or wheeled litter, light or standard ambulance, according to conditions. The responsibility of the battalion surgeon ceases when the case leaves the battalion aid station.

Forward displacement. The battalion aid station must be maintained closely in rear of the battalion, in order to promptly receive the wounded and avoid unduly long carry by litter. It is accordingly moved forward by bounds as the battalion advances. A medical officer of the battalion reconnoiters the terrain and recommends to the battalion commander suitable locations for aid stations. These forward movements of the aid station are usually accomplished as far as possible during the halts on captured objectives. Supplies which have been consumed in the treatment of wounded should be replaced by others sent forward in ambulances from the medical supply unit. One or two men of the attached personnel remain at the old station for the care of such wounded as may be on hand until they are taken over by the ambulance company. In order to permit the personnel and matériel attached to the battalion to go forward with their organization, the regimental surgeon may detail personnel and matériel from the regiment or reserve battalions to care for wounded at the rear station.

In case of a rapid movement when transport cannot follow, the necessary supplies and equipment for the battalion aid station are taken up as opportunity offers, by any means available. No formal aid station is established while the advance continues, but

the wounded are collected in successive groups with shelter as available, given first aid, splinted, dressed and made comfortable, and left for the ambulance companies to evacuate. A man should be left in charge of such collections of wounded and their location made known to the ambulance company. A liaison officer is provided by the ambulance company to keep in touch with the battalion aid stations.

When a second line battalion executes the maneuver of "passing of lines," taking its place as a first line battalion, the attached personnel of the old battalion should remain on duty at their last station until all their wounded have been evacuated or until the station is taken over by the ambulance company.

REGIMENTAL AID STATIONS

Regimental aid stations, when established, perform functions similar to those of battalion aid stations, and may either supplement or replace the latter. If this be not required the regimental aid station becomes merely a co-ordinating point, at or near the regimental command post, at which the regimental surgeon receives the orders of the regimental commander and co-ordinates the work of the battalion medical personnel.

Regimental aid stations are accordingly established only when actually required. In case of a rapid advance when the battalion medical personnel must move frequently and cannot find stations in which they can properly perform their functions a regimental aid station may be established. In such case the battalion stations become collecting points and the regimental aid station performs the functions usual to the battalion aid stations. This might occur when in open warfare a regiment had two battalions in the first line. A regimental aid station may thus occasionally serve the needs of the entire regiment, making unnecessary the establishment of separate battalion aid stations.

The requirements for a regimental aid station as to location, etc., are similar to those for a battalion aid station.

AMBULANCE HEAD

Ambulance head is the most advanced point which can be reached by ambulances and at which a group of ambulances may be safely and conveniently held. From this point single ambulances

may be dispatched to battalion aid stations, or as close thereto as possible. Where ambulances cannot proceed to battalion aid stations the patients must be brought to ambulance head by litter, or by any other means that may be made available.

Ambulance heads are established during combat in both stabilized and open warfare. One such station ordinarily serves about three battalion aid stations, and there would accordingly be about two or three per division in line, depending on the number of battalions in the first line, severity of the engagement, road situation, etc. For example, in an attack with two infantry regiments in line in the division zone of action, there would usually be one ambulance head for each regiment. These might be established in the first instance by a single ambulance company, additional companies being assigned as needed, or two ambulance companies might be assigned from the outset, one to each regiment, if heavy casualties were anticipated.

In order to reduce the carry by litter, the ambulance head should be placed as well forward as road and traffic conditions, and safety from hostile fire permit. It should be conveniently located with reference to the battalion aid stations or collecting points which it serves, approximately opposite the center of its sector and on (or near) the natural line of evacuation. There should be good communications to front and rear, routes sheltered from observation and fire as far as practicable. Ambulance head is usually maintained at from 800 to 3,500 yards in rear of the line of battalion aid stations, 1,200 to 1,500 yards being an average distance. Occasionally it may be necessary to occupy different localities and employ different routes by night and by day.

There should be close liaison between each ambulance head and the ambulance park in rear, and ambulances are sent forward from the park as they are needed. The personnel at ambulance head should know the location of all aid stations or evacuation points where ambulances or litters may be required.

In case of an advance, ambulance head moves forward so as to be always closely in rear of the battalion aid stations which it serves.

AMBULANCE PARK AND REGULATING STATION

In periods of relative calm in a stabilized sector one ambulance company usually establishes such ambulance heads as are required

by the division. A few ambulances are placed at each ambulance head, and single ambulances may be stationed, or sent as needed to points still farther in advance, to battalion aid stations if possible. The headquarters of the ambulance company on this duty, with the remaining ambulances, is established a mile or more in rear of the ambulance heads, and on the line of evacuation therefrom. This place is called an ambulance regulating station, and from it ambulances are sent forward as needed to replace those moving to the rear with casualties from the ambulance heads.

In both open and stabilized warfare the headquarters of the ambulance section of the divisional train and an ambulance park, are established in a central position, convenient with reference to the routes of evacuation and the other medical department stations. This park is located usually near the axial road of the division, or the route assigned for evacuation, in the same locality, but slightly in advance of the triage or forward group of divisional field hospitals. During stabilized warfare one motorized ambulance company is held at the ambulance park in readiness to relieve the company serving the ambulance heads. The other motorized company is at rest or refitting in the same locality or farther to the rear. The horsed ambulance company is engaged in miscellaneous duty in rear. In times of activity and movement all the reserve ambulance companies (2 or 3) are held at the ambulance park in constant readiness to move forward.

AMBULANCE DRESSING STATION

The wounded, having received first aid and preliminary treatment at the battalion aid stations, are thereafter sent through to the divisional triage as rapidly as circumstances permit. Additional dressing stations on this route should ordinarily be unnecessary. Where the circumstances are such however, that a considerable time is required to reach the triage, such as poor roads, a deep zone of litter carry, (as in flat, open country) a broken bridge, etc., ambulance dressing stations may be necessary, and the ambulance companies are equipped to establish them. (War organization. Under the new organization such a station, if required, would be established by the personnel of the sanitary companies.)

These stations, if employed, should be in convenient sheltered places, and generally as close as practicable to the ambulance

head. The attention given the wounded includes readjustment of dressings and splints, checking hemorrhage, nourishment, heat, anti-shock treatment, etc. Shock usually manifests itself some little time after the receipt of the wound, and may, therefore, occasionally develop en route to the triage. Serious cases should be held awaiting favorable reaction before being further evacuated.

Location of forward stations. Stations where wounded are collected (including battalion aid stations and ambulance heads) should not be established on the main roads, especially at important cross roads and villages, where they will be subject to shell fire. They should be convenient to the routes of transportation, however, and accordingly may well be established on unimportant branch roads, accessible to ambulances and at a safe distance from the main routes.

THE TRIAGE (SORTING STATION)

During periods of great activity in the war of movement each first line division establishes a sorting and diagnosis station for all casualties, called the triage. This is the most advanced station established by a divisional medical unit at which all casualties arrive, including the walking wounded, who are directed thereto. It is usually located in a central position, on the natural line of evacuation, and at a distance of from 3 to 5 miles from the front line. It is established and operated usually by a field hospital company. But if the hospitalization facilities are over-taxed the triage may be established by the personnel of an ambulance company, or a combination of ambulance and field hospital personnel and equipment. (Under the new organization sanitary companies may be so employed when necessary.)

The triage is the headquarters of the divisional medical personnel in action. Here are found the division surgeon (except when absent in company with the division commander or on other duty), the divisional medical supply unit, division gas officer and consultant specialists of the division.

At the triage takes place the definitive sorting of all casualties for final disposition, whether to field, mobile or evacuation hospitals. A record of all casualties is kept, and from the triage record the division commander determines the number and nature of his losses in sick and wounded.

The triage should be conveniently located with reference to the routes of transportation both to front and rear. It is usually near and slightly in advance of the divisional field hospitals. When the advance of the troops leaves the triage more than 5 miles from the front it should be re-established further to the front by a reserve unit (field hospital company).

The location of the triage should be announced in operation orders.

Walking wounded. Walking wounded should pass through the aid stations and ordinarily through ambulance head. They are tagged (the tag serving as a pass to the rear) and sent to the ambulance head or triage, (preferably in groups under wounded officers or non-commissioned officers) where they are disposed of like other cases. They are given the necessary treatment and sorted into those able to return to the front and those to be distributed to the various hospitals. Transportation from the ambulance head to the triage and from the triage to the hospital, is provided when practicable. Those who are able to return to the front are turned over to the provost marshal.

FIELD HOSPITAL COMPANIES

Field hospitals constitute the most advanced elements of the medical service at which facilities are available for surgical treatment and temporary hospitalization of the wounded or sick. They are the emergency hospitals of the battle field. Their functions are to care for serious cases whose condition does not permit their immediate evacuation to the rear (non-transportables), to diagnose, sort and distribute the casualties, to afford hospitalization facilities to cases requiring only a few days for recovery, and to give temporary care and restorative treatment to transportable cases pending their further evacuation.

Surgical operations should not, unless in emergencies, be performed in the divisional field hospitals, except when the division is operating independently. Mobile hospitals, when available, are employed for this purpose. The following remarks are subject to this qualification.

The mobility of the field hospital companies enables them to maintain their positions closely in rear of the combatant troops. Their capacity for hospitalization is 216 patients (under new

organization, 250), sheltered under tentage. This capacity may be considerably increased if buildings are available for shelter. In preparation for attack all cases in field hospitals should be evacuated to the rear. The divisional equipment is thus maintained mobilized, ready to accompany the division in case of an advance.

In periods of relative calm when the troops are not in motion, the four field hospital companies of the division may be assigned as follows: one for medical cases (including contagious diseases and exhaustion); one for gas cases; one for non-transportable surgical and shock cases, and minor surgical cases which need not be sent to the rear; while the fourth may be utilized to meet such local necessities as inspection and delousing of troops coming from the front, treatment of skin diseases, isolation of contacts and carriers and cases suspected of being communicable disease, establishment of venereal labor camps, etc. Infectious diseases are usually not retained at divisional field hospitals but are sent to the evacuation or other hospitals established by corps or army for their reception.

Hospital for medical cases. Here all patients are given the necessary preliminary treatment, and returned to duty when fit. Those who will require not over 7 to 14 days hospitalization are usually retained for that period unless the hospital is congested or a move imminent. Light cases which will require a longer period of convalescence are sent to the army convalescent depot, serious cases to the evacuation hospital, contagious cases to the corps hospital for contagious diseases, if such has been established.

Hospital for gas cases. This includes a portable de-gassing equipment (not in new organization), a prominent feature of which is a portable bath (on a truck), and a supply of fresh clothing for gas cases. Here all gas cases are given preliminary treatment and disposed of in like manner to the sick.

Hospital for surgical cases. Wounded requiring immediate operation to save life are sent to the mobile hospital for non-transportable wounded. These include primarily sucking chest wounds, severe abdominal wounds, badly mangled limbs, cases of severe hemorrhage, and severely wounded in deep shock. Their number will usually not exceed about 6% of all casualties. Ordinarily two or three surgical teams will be able to care for those

urgently requiring operation. Additional surgical teams may be employed in times of stress.

Wounded capable of transportation are sometimes sent direct to the evacuation hospital. Those taken into the field hospital are given anti-shock treatment, and are examined by a competent surgeon who determines which cases may be evacuated, after recuperation, and which should be operated upon at the field hospital. All cases are evacuated as soon as practicable after operation. The number of operations performed at field hospitals should not be excessive as they would thus soon become congested and immobilized in times of activity. But on the other hand a patient who requires prompt treatment and is in no fit condition for further travel should not be sent to the rear merely to avoid an operation at the field hospital. A proper balance between conflicting demands must be maintained.

Field hospitals should be established beyond the area of intensive artillery fire, conveniently with reference to the roads. Depending on the terrain and the tactical situation their distance from the front line may vary from about 3 to about 6 miles. They should be in sheltered localities not apt to be shelled, but near the routes of evacuation. A supply of water near at hand and buildings available for shelter, are desirable but not essential—water may be brought up.

It is usually desirable to group the hospitals in the same locality when the road situation makes it possible, as it usually does. This grouping effects a pool of resources, facilitates sorting, evacuation, administration and control, and utilizes the available facilities to the best advantage. One hospital will not be congested while another is empty. The ambulance drivers have only one place to go and there is no danger of patients being taken to the wrong hospital. Transportation is economized and delays which might be dangerous to the patients are reduced to the minimum. Evacuation to the rear is also simplified and facilitated. When it becomes necessary to send a hospital forward it is easily released by transferring its patients to another which could not be done as readily if all were in different localities.

In times of activity and rapid movement, when the number of casualties is large, one or two of the field hospital companies may establish the triage, and perhaps a hospital for gas cases,

at from 3 to 5 miles from the front. The others are held at a convenient locality, a mile or so in rear, in reserve. In case of a considerable advance the companies in reserve pass those already in action and establish a new triage, etc., closer to the front. Those previously in the forward position, after having been cleared of accumulated cases, are then in reserve. In this manner the field hospital companies of the division advance (or retire) by bounds so that the triage may never be more than 5 miles from the front. Sheltered localities should of course be sought, but it is not always possible to remain in rear of the area subject to intensive artillery fire, as the triage should not be more than 5 miles from the front. Field hospitals have each three sections and may utilize these in advancing by bounds. Mobile hospitals are assigned by the army to reinforce the divisional triage when necessary.

Forward displacement. Army ambulance companies (called evacuation ambulance companies) are used to evacuate the cases from the divisional hospitals to the evacuation hospitals, or to mobile hospitals established closely in rear of the divisional area. Mobile hospitals or field hospitals of the corps or army may be moved forward to take over directly from the divisional hospitals the cases which cannot be at once evacuated. This can usually be accomplished without disturbing the patients.

The field hospitals should at all times be cleared as rapidly as possible, by evacuating all their patients as soon as they are in a condition to be moved. Their capacity is limited and they must not be immobilized by unnecessary congestion, in view of the necessity of being prepared as far as possible for the reception of fresh cases, or for a move in either direction.

Time of establishment. The field hospitals of the division should never be immobilized by premature establishment. This precaution is of particular importance in the operations of single divisions, or relatively small forces acting alone in open warfare, where changes in conditions may occur with great rapidity. It is seldom necessary to set up this equipment at the very opening of an engagement. It may be several hours before the wounded begin to arrive at the hospitals. The necessity for their use and the locality at which they are required will then be more apparent, and it is wiser to hold them in readiness for a time rather than to hurriedly establish them in a locality which may later prove to be too far to front or rear, or otherwise unsatisfactory.

EVACUATION HOSPITALS

Evacuation hospitals are mobile army units, maintained comparatively close to the front. They provide complete facilities for operation and hospitalization of sick and wounded, and specialists for the treatment of various classes of wounds and disease. They receive all cases evacuated from field hospitals, administer the necessary emergency treatment, retain the serious cases requiring immediate operation or hospitalization, and evacuate the remainder by rail or water to the base hospitals. They constitute accordingly hospitals for the treatment of urgent cases and rest and clearing stations for casualties en route to the rear. In stabilized warfare they may be organized as very complete sanitary camps with water supply, drainage, and model sanitation. The excellence and permanence of these arrangements depends, of course, very largely on the general military situation as affecting the frequency of moves. In war of movement their transportation and installation should be rapidly accomplished, and they should accordingly always be ready for a move on short notice.

Location and grouping. Evacuation hospitals are army units, and in stabilized warfare are usually located with reference to areas rather than organizations. In mobile warfare the usual assignment is two per division in line, and they are usually grouped in pairs.

These hospitals are ordinarily found between 10 and 20 miles from the front, as it is desirable to avoid bombing by aeroplanes and long range artillery fire, at least to a great extent. For convenience of evacuation it is essential that they be placed on a rail or water route, but not too close to an important railhead or depot, liable to be a target for bombing raids or long range artillery fire. If practicable, as will usually be the case in stabilized warfare, they may be placed off the main line of the railroad, with a spur connection thereto. They should never be in the same locality as depots, dumps, cantonments, factories, aviation or tank centers, or other places liable to be the objectives of hostile artillery or bombing raids. Hospitals assigned for neurological and gas cases need not be on the railroad. All evacuation hospitals should be plainly indicated to hostile aircraft by large crosses placed on the ground adjacent to the hospital.

The location of these hospitals with reference especially to their distance from the front, must naturally depend very greatly on the general military situation. When the army is on the defensive, confronted with the possibility of a break-through by the enemy they must be placed farther back than where there is no such possibility. They should in such cases also be established in tents as far as practicable, in order to increase their mobility.

The location of the evacuation hospitals or the evacuation points to which patients for such hospitals are to be sent, should be announced in operation orders.

Capacity. The hospitalization capacity of a single evacuation hospital requires about 750 beds, in tents. A crisis expansion may be effected if additional tents are provided or buildings are available.

The system of evacuation hospitals in conjunction with other army hospitals should provide normally, in the zone of the army, hospitalization facilities for about 2,000 patients per 25,000 combatant troops. During combat additional hospitals are provided whenever those in action are six hours or more behind their schedule. It is the duty of the director of evacuation hospitals of the army to provide additional facilities when necessary, and to equalize the work of the evacuation hospitals. In preparation for combat a reserve of evacuation hospitals should be available as needed. Evacuation hospitals should preferably be housed in double walled tents which afford better shelter than unsealed buildings besides being more mobile. Their facilities may be extended by utilizing buildings in the vicinity.

One operating table, with three teams operating continuously, can in the first 24 hours ordinarily dispose of:

25 seriously wounded, or
40 moderately wounded, or
100 slightly wounded.

Additional tables and teams are furnished as required.

Disposition of casualties. During periods of calm, evacuation hospitals care for minor cases of sickness and injury whose periods of hospitalization will probably be too long to warrant their retention at the field hospitals and too short to render economical their evacuation to the base. In times of stress, however, when their

capacity is taxed, the evacuation hospitals treat only the most serious cases, evacuating to other hospitals all that are in a condition to endure transportation. Considering the needs of pre-operative treatment, care of wounded awaiting transportation, and hospitalization of operation cases, the capacity of an evacuation hospital in times of activity will usually be taxed in operating upon 20% and subsequent hospitalization of 10% of all wounded arriving from the front.

In order to be prepared to handle fresh cases the evacuation hospitals should be kept cleared as far as possible, especially during periods of activity, or when combat is imminent. Their period of hospitalization should accordingly be, as a rule, about ten days to two weeks. Cases which will probably require longer than four weeks' hospitalization should be promptly evacuated to the hospitals in rear, unless their condition is such as to demand immediate treatment at the evacuation hospital, or rest and recuperation before further travel. Patients who have undergone serious operations, and whose vitality is low cannot, of course, be immediately evacuated, and must be hospitalized, usually for about ten days, before being transported. At the end of ten days, however, or sooner if possible, patients are, as a rule, sent to the army convalescent depot or base convalescent camps, or evacuated to other hospitals, according to their condition.

Evacuation hospitals are *general* hospitals, and handle all classes of cases, even contagious disease, for which necessary isolation is of course provided.

Forward displacement. In case of advance or retreat the evacuation hospitals are moved to the front or rear under the same conditions and about as frequently as railhead, unless the advance be very rapid. To facilitate the forward movement evacuation hospitals operate in groups of two. When the advance of the front leaves them too far in rear one of them transfers its non-evacuable cases to another, and moves forward. Mobile hospitals may also be established in advance, to serve as a nucleus, pending the movement of the evacuation hospitals.

Relay hospitals. When the evacuation hospitals are at a considerable distance in rear or the route of evacuation thereto badly congested and liable to interruption, a relay field hospital may be established at an intermediate point, usually by the corps.

Its function is the care of cases which have been ordered to evacuation hospital, but because of delay are in need of attention en route. Surgical treatment and hospitalization are afforded to such cases, if necessary.

ARMY CONVALESCENT DEPOTS

These are convalescent camps (10,000 bed capacity) established in the army area (army service zone) under the control of the army authorities. Their function is to maintain the strength of combatant organizations, and to save transportation, by preventing the evacuation to base hospitals of slightly sick, wounded or exhausted from field or evacuation hospitals, who require only a short or moderate period of rest and recuperation to render them again fit for duty.

These depots provide medical and hospital facilities, rest, recuperation and training, similar to that given at base convalescent depots. They are located generally in or near towns to permit crisis expansion by utilizing the buildings thereof. They should also be located close to the station of the replacement division.

During active operations, when the number of casualties is large, it is of particular importance that cases of exhaustion, light sickness or wounds, or suspected simulation (malingering), be sent to the army convalescent depot and not evacuated farther to the rear and beyond the control of the army commanders, where their services would probably be lost to their divisions for a much longer period. Cases developing serious symptoms at the convalescent depots are sent to the rear.

All cases from the evacuation hospitals, especially gassed and sick, who will require not more than two weeks' convalescence to fit them for duty, should be sent to this depot. In this way considerable depletion of the fighting strength of the divisions may be avoided.

In exceptional cases divisions may establish small convalescent camps for similar purposes.

Clearing of stations. The successful evacuation and treatment of the wounded demands that at all times, but especially in those of stress, all mobile stations near the front (from battalion aid stations to evacuation hospitals, inclusive) be cleared as promptly

as possible of all accumulated cases in order that they may be prepared to receive fresh cases, or to move to the front or rear, as the military situation demands. The same rule is applicable, though to a lesser extent, to all military hospitals, convalescent camps and depots. Otherwise these stations might become so congested as to immobilize the equipment and interfere with the proper care and treatment of the wounded.

The removal of wounded from the field of battle is the duty of the medical personnel attached to the combatant units, who may call on the commanders of these units for assistance in case of need. The evacuation or clearing of the battalion aid stations is the duty of the ambulance companies of the division. The clearing of the field hospitals of the division in order that they may be released for forward movement and remain under the control of the division surgeon, is the duty of corps and army authorities. The division is not responsible for evacuation in rear of its own field hospitals. Evacuation from the divisional triage, except of cases destined for divisional field hospitals, is made by evacuation ambulance companies.

Replacement of supplies. At each station where patients are delivered the litter bearers or ambulances which bring them in should carry back with them to the forward stations from which the patients came, full replacements of all supplies delivered with the patients, such as litters, splints, medical supplies, dressings, blankets, hot water bottles, etc. These supplies are replaced ultimately from the divisional medical supply unit, but issues are made at each station where patients are received. This insures against the exhaustion of these necessary supplies at the forward stations. At the larger stations an officer is detailed to check and replace such supplies. In times of activity all ambulances returning to the front should be loaded with supplies for the forward stations.

Police, guards, salvage and equipment of patients. At each important station of the medical corps there should be a squad of military police to act as guard and to take charge of all skulkers, or very slightly sick or wounded who are declared by the medical authorities fit to return to the front.

When patients arrive at an evacuation hospital for internment their clothing is turned in for salvage. Their arms and accouterments should be salvaged by the salvage service. When a patient

is released from a hospital he should be provided with new clothing, and accordingly each hospital should have a depot for receiving salvage and making issues.

ARMY AND BASE HOSPITALS

These are semi-mobile or non-mobile hospitals, located at such a distance from the front that they will not be involved without ample warning by even rapid unfavorable developments in the military situation. They are found, according to needs, distributed from the zone of the army (inclusive) to the base section of the service of supply. In order to reduce transportation in both directions a number of these hospitals may be placed in the zone of the armies and the advance section of the service of supply. These hospitals are located according to areas and routes of transport available, considering also the probable activity of military operations on different portions of an extended front.

Army hospitals are those located in the zone of the armies, ordinarily some 30 to 40 miles from the front, and under the control of the commanders in the field. The advantages of having certain large hospitals well forward, under control of the army commanders are obvious. They are conveniently near to the front and the field army authorities control the disposition of patients evacuated therefrom, which insures as a rule, a more prompt return of effectives to their organizations. Patients who cannot be held at evacuation hospitals but whose periods of hospitalization will probably be too short to warrant sending them to a base hospital, are evacuated to permanent hospitals under army control.

Base hospitals are those located in rear of the zone of the armies. They are under the control of the service of supply.

These non-mobile hospitals (army and base) vary in size, being often composed of standardized units, each accommodating 1,000 to 1,500 patients, any number of which may be grouped to form a hospital center.

Hospitals for cases requiring long periods of hospitalization or highly specialized treatment, or which will probably be permanently incapacitated, are usually placed well in the interior, at base ports, or in localities favorable for treatment and convalescence.

Base hospitals may be either general or special. The number of specialized base hospitals should be held to the minimum that is actually required. For most special cases specialized wards in a general hospital are to be preferred, as insuring better control and administration, simplifying evacuation, and securing a more prompt return of effectives to their organizations.

Patients discharged from base hospitals are sent to convalescent camps, and subsequently to convalescent depots, replacement depots and divisions and ultimately to organizations.

In operations in the home country or contiguous territory, civil hospitals, under military control or supervision, may be employed for the treatment of wounded, especially those requiring a long period of hospitalization or very specialized treatment.

Camp hospitals. Camp hospitals meet the needs of organizations serving in rear areas. They have a capacity of 300 beds.

Base convalescent camps and depots. Convalescent camps and depots are successive steps in the return of convalescents to their organizations. Convalescent camps receive patients discharged from base or evacuation hospitals, who still require medical surveillance, but not continuous treatment. Here the men receive in addition, physical, disciplinary and moral training under competent officers to fit them again for duty with their organizations.

From the base convalescent camps the patients are sent to convalescent depots, which should usually be nearer the front than the camps. Thence they are sent to replacement depots or divisions, or to organizations.

REMARKS ON LOCATION OF HOSPITALS

A contaminated wound is not at first the seat of a spreading infection. If it is operated upon promptly, and dead tissue removed, infection is usually forestalled and recovery is more certain and more rapid. If the operation is delayed until the infection is well advanced, even a slight wound may become serious, the patient may not recover, and the length of his period of convalescence is in any case increased. No antiseptic treatment can take the place of prompt and thorough aseptic treatment.

Consequently the operative hospitals for both seriously wounded and slightly wounded, should be as near the front as it is practicable to place them, balancing the time required for evacuat-

ing the wounded against the necessity for providing safety and proper facilities and conditions for the efficient performance of operations, and proper subsequent treatment.

The location of hospitals is very largely dependent on the general military situation. If a hostile offensive is expected and apt to be successful, they must naturally be farther back than if this were not the case.

Hospitals should generally be located where they are not apt to be shelled or bombed. This means that they should if possible be clear of the main roads and railroads and certainly of all other military establishments of all kinds, such as regulating stations, depots, dumps, factories, aviation and tank centers. If carefully located away from such establishments it is better that the hospitals be not concealed or half suspicious in appearance, but conspicuously placed and marked so that their identity cannot be mistaken. A hospital which is easily recognized as such, and is clear of other establishments, will seldom be shelled or bombed, as such action constitutes a flagrant violation of the laws of warfare. It is to be remembered, however, that a large increase in the number of hospitals in the zone of the armies, or even the advance section of the service of supply, generally indicates a contemplated offensive—an indication not likely to be overlooked by the enemy's air scouts.

Congestion of hospitals can be avoided by locating them in towns or by establishing camps near the hospitals, where the less serious cases or those in early stages of convalescence can be billeted or tented under the supervision of the medical authorities.

SEARCH AND POLICE OF BATTLEFIELD

During the progress of an engagement continuous systematic search of all areas in which wounded may have fallen is conducted by the medical personnel. Combatant officers should inform the medical officers as to all areas known or supposed to contain wounded. When an advance has been made all areas passed over in the attack should be thoroughly searched.

At the close of an action or during lulls therein, each division polices that portion of the battlefield included within its sector. This duty is performed under the general direction of the division surgeon by medical officers and details from reserve or labor troops.

(Under the new organization it will be performed by the "sanitary battalion.") The attached medical personnel and the personnel of medical department units should not be employed on such duty if this interferes with their usual functions. Wounded are evacuated, the dead are collected, identified, recorded and removed to place of burial, carcasses are buried or cremated. The medical personnel is responsible for the evacuation of the wounded, and supervises and assists in police and the burial of the dead.

MEDICAL SERVICE IN OPEN WARFARE

The organization of the medical service is designed primarily to meet the needs of the war of movement, which makes the heaviest demands upon it and typifies its use. In a stabilized sector more elaborate arrangements can usually be made, and the service takes on some of the features which are characteristic of a military station in time of peace.

MEDICAL SERVICE ON THE MARCH

Sanitary train. On the march the units of the sanitary train of the division are distributed according to the tactical situation and the probable needs.

One ambulance company is assigned to the advance guard during a forward movement, or the rear guard in retreat, marching between the advance (or rear) guard and the main body. The animal drawn field hospital marches with the field trains (generally in the rear of the column) or behind the caisson section of the ammunition train. The motorized units of the sanitary train march with the other motor trains, either at the head of the column or in rear of the ammunition train, depending upon the proximity of the enemy. If other motor transport accompanies the flank guard of a division, a complete motor ambulance company may be assigned, otherwise the bearer and dressing sections (of the horsed company) only, with no motors, would usually march with the flank guard.

When on the march not in the near presence of the enemy ambulances may be assigned to regiments for the accommodation of the sick, footsore and weary, who are obliged to fall out of the column. As motor ambulances cannot well march in column with

foot troops, horse drawn ambulances are used for this purpose. (Under the new organization this duty may be performed by the battalion medical wagons.) Upon arrival in camp or billeting area the accompanying ambulances promptly evacuate all cases to the field hospital established for their reception. The ambulances then rejoin the sanitary train. On the march in the presence of the enemy, the ambulance companies should remain intact.

When action is imminent the sanitary train is released from the control of the commanding officer of trains. The ambulance company with the advance guard or rear guard takes a position in readiness, or is established, under the orders of the advance or rear guard commander. The other ambulance companies are assembled at a point where they may be sent forward to position when required. As their function is to collect, sort and evacuate the wounded, they carry little equipment other than transportation and simple shelter and dressing outfits.

An ambulance company or a number of ambulances are assigned to regiments acting independently.

During the march an evacuation ambulance company of the army will be kept well up to the tail of the division, in order to secure early evacuation from the field hospitals, so that they can be freed for the next day's movement. The evacuation hospitals will be kept packed on truck, car, or boat and will be moved up as the division advances, so that they will be at no time more than twelve hours' journey, by the transport carrying them, away from the division.

Attached medical troops. The surgeon marches with the staff of the regimental commander. The enlisted personnel not assigned to battalions marches at the tail of the regiment. The regimental surgeon is the medical and sanitary adviser of the commanding officer, assists in selecting sites for camps, inspects the water supply on the march and in camp, and provides for the care of the sick and disabled of the march, etc.

The battalion medical troops are assigned from the regimental medical detachment. One medical officer, a dental surgeon, and enlisted personnel march with the combat equipment at the tail of the column. The senior medical officer rides with the battalion commander. All men falling out of the column are examined, treated and tagged, and sent back to proper transportation, or

continued in the column as their condition requires. If the battalion is acting independently, the duties of the senior medical officer present are the same as those of a regimental surgeon.

Movements by rail or truck. In these movements the attached medical personnel accompany the units to which they are assigned. The motorized and horsed sections of the sanitary train accompany the columns of similar transport of other divisional trains. Patients in the divisional field hospitals are evacuated to or taken over by other hospitals prior to the movement. Serious cases of illness developing in organizations en route may be evacuated to established hospitals from designated stations on the line of march.

MEDICAL SERVICE IN CAMP, BIVOUAC AND BILLET

When the command is stationary the medical service performs its usual functions, medical, hygienic and sanitary, as hereinbefore described. These include especially housing and shelter, examination of food and water, disposal of wastes, drainage, delousing, bathing, drying of clothing, personal hygiene, precautions against the spread of communicable diseases, care of the sick and general maintenance of sanitary conditions.

Medical officers should be consulted in the selection of areas for occupation by troops.

Attached medical troops. These are usually quartered and messed with the headquarters company of the regiment with which they are serving in the camp or bivouac. If billeted, the battalion aid station is established as a local infirmary in some building, and the medical troops sheltered in the same or a nearby building. Sick call is held by battalion daily, one or more hours after arrival in camp or billet, and the cases requiring evacuation conveyed to the aid station for subsequent collection by ambulances.

In billets where the battalions are widely dispersed, ambulance calls will be made to battalion aid stations or detached companies at stated hours, for collection of cases for evacuation.

Sanitary trains. With the exception of field hospital companies established for the temporary care of the disabled pending evacuation to the rear, the sanitary train camps with its units consolidated in a position to cover the division, should it deploy, and to permit joining the column for the march without counter-

marching or interference with the movements of other organizations. In billets the sections are grouped, in order to facilitate training and control. In camps of considerable duration camp hospitals are established, by personnel and equipment from without the division, in order to free the field hospitals of the disabled, so that they will be mobile to secure proper training in field service or move out with the command in campaign.

Sanitary squads. Sanitary squads consisting of one officer and 26 men are used for the sanitary inspection and administration of divisional, corps, army and rear areas to which attached. They work under the immediate orders of the local sanitary inspector. Commanding officers and surgeons of all units are, however, responsible for the sanitary condition of the areas occupied by their commands, which are subject to the supervision of the sanitary inspector.

MEDICAL SERVICE IN COMBAT

In the war of movement there will usually be less matériel available than in stabilized warfare. The facilities for transportation and elaborate shelters of the highly organized positions will be lacking. Reserve equipment will be more difficult to obtain.

It will usually be much more difficult to foresee the developments of the combat, the number and location of the wounded, and the places where stations will be required. This will be especially true in case of a rencontre engagement. It will therefore be unwise to prematurely immobilize all the medical units by setting them up at localities where they may not be needed. It will ordinarily, however, be practicable to select a preliminary position for each unit, at or very near the locality where it will eventually go into action. Here the unit is held in readiness to await the developments in the situation. Orders accordingly, should not attempt to prescribe details in advance, and the solution must depend on the judgment of the medical officers on the spot.

The medical personnel attached to organizations must remain with them during the course of the combat. The wounded are promptly collected and first aid is administered, but if the organization is moving rapidly forward (or to the rear) the combat equipment of the medical personnel cannot be immobilized to set up aid stations. When the movement ceases or becomes less rapid,

and the number of casualties warrants it, aid stations may be established.

In the event of a rapid advance no time will be saved by premature attempts at evacuation, possibly involving long carry by litter. In such cases the wounded are collected at sheltered points on the routes of advance, where they may be taken over by the medical units following up the movement, with a minimum of transportation.

When the attack opens, the division surgeon sends forward one or two ambulance companies, usually those which have been assigned to the column of march of the combatant troops. These are ordered to make contact with the combatant troops and ascertain the localities for ambulance heads and collecting stations and routes thereto. The commanding officer of these companies establishes an ambulance park and sends forward reconnoitering parties for this purpose. The remaining ambulance companies and one or two field hospitals are held in reserve at a point convenient to the natural routes of evacuation, and liaison is established with the advanced ambulance companies.

The wounded are assembled by the advanced ambulance companies and given the necessary treatment. If the advance has been checked the wounded are eventually evacuated to the advanced field hospitals, and additional ambulance companies and field hospitals are sent forward when the need for them and the localities at which they are required have become apparent. If the advance continues, the reserve ambulance companies go forward, passing those already established, gain contact with the combatant troops and establish new ambulance heads. One or two field hospitals are sent forward to take over the wounded collected by the ambulance companies at the collecting stations first established. Often they will be able to reach the early ambulance heads and take over the wounded directly without further transportation. The ambulance companies thus released are mobilized and held in reserve in case of a further advance or until the need for their establishment develops. The ambulance companies and field hospital companies thus move forward in echelon by successive bounds in following up the advance. Evacuation hospitals are brought up later as needed, and take over the patients from the field hospitals in much the same way, evacuation ambulance companies providing the neces-

ary transportation. The field hospital companies are thus released to follow up the advance.

In case of retreat a similar movement in echelon is performed. The evacuation of the wounded, however, will be a more serious problem, and all available transportation must be pressed into service.

The animal drawn transport is utilized to meet the situation created by poor roads in forward areas. Motor head is pushed as far forward as possible and the haul by animal transport thus reduced to what is strictly necessary.

Success in properly caring for the wounded, and the intelligent location of medical stations and evacuation points demands efficient liaison between attached medical department personnel and all medical units. The division surgeon keeps in close touch with the developments of the combat, receives reports as to the number of casualties in different areas, largely from his assistant on constant duty at division headquarters, and from this intelligence decides the times and places for putting his units in action, and the areas of their activities.

In open warfare the intensity of hostile artillery fire will be less than in operations in a stabilized sector. Medical stations may therefore often be established closer to the front than in the attack or defense in a stabilized sector.

In open warfare all the stations and units of the medical service are thus maintained at the appropriate distances from the front by continual "advances by bounds," utilizing the several units of each type and the sections into which they may be divided. It is the duty of corps and army authorities to clear and evacuate the accumulated cases in the divisional field hospitals, thus preserving their mobility and permitting them to keep pace with the progress of the attack. This is accomplished by the employment of the evacuation ambulance companies to transport the wounded to the evacuation hospitals, and by the use of mobile hospitals set up as needed at or near the site of the divisional field hospitals, and the use of available buildings or tentage.

LIAISON

Close liaison between all stations which co-operate in the process of evacuation is essential, especially during open warfare The regular systems of liaison are utilized as far as practicable,

but these must be supplemented by the assignment of liaison personnel between units, by couriers and runners. In open warfare hasty telephone lines along the routes of evacuation are utilized, in common with other services.

It is the function of the division and regimental surgeons to insure proper liaison within their spheres of activity. During times of activity reports will be made at frequent intervals.

The following liaisons will be of special importance:

Between attached medical department troops and the combatant units they serve.

Between ambulance head and its collecting stations and the regimental or battalion aid stations which it serves.

Between ambulance head and the field hospitals to which it evacuates.

Between ambulance head and the director of ambulance companies.

Between the division surgeon and all medical units, which have been detached from the train to perform their regular functions.

Battalion and regimental command posts should be in close touch with the corresponding aid stations, and regimental and battalion surgeons should be advised of all contemplated operations and localities where wounded are to be found.

The litter bearer section of an ambulance company (or a "sanitary company" under the new organization), under an officer, is sent forward to work in co-operation with the regimental medical detachments. This officer is responsible for liaison between the ambulance head and the battalion aid stations which it serves. He details one or two men as runners to each battalion aid station and to the regimental surgeon. It is his function to know the locations and contemplated moves of the aid stations or places where wounded are collected for evacuation, routes thereto, number and classes of casualties to be evacuated, etc.

The division surgeon, directors of ambulance companies and field hospital companies, and the commander of the sanitary train, maintain liaison with each other, with all established medical stations, and through them with the combatant troops. The corps surgeon maintains such liaison as necessary with the divisions.

ORDERS AND PLANS

The arrangements for the evacuation of the wounded are included in the attack and defense plans of armies, corps and divisions. They are covered in Par. 4 of the field order and the annex thereto (when issued), entitled "Plan of communication, supply and evacuation."

Prior to the preparation of such general plans the chief surgeon of the command is advised by the chief of staff as to the situation and the additional personnel and equipment (if any) that will be placed at the disposal of the medical authorities. The surgeon then prepares and submits to the staff a memorandum on which the plans are based. This memorandum will include a request for any additional facilities deemed necessary.

The evacuation plans set forth in the annex to the operation orders should include no technical nor administrative details which are the exclusive concern of the medical authorities, and should be brief. They cover only such tactical and administrative details as are necessary for the guidance of the medical authorities and the information of other troops, omitting all matters of routine or general custom.

The evacuation plans of corps and divisions will include such of the following items *as may be necessary* in the particular case.

1. Assignment of additional medical equipment and personnel for combat. Times and places at which they will be made available.

2. Assignment of additional transportation for the wounded and joint use of other transportation, with necessary details of the arrangements.

3. Routes of evacuation, including trenches, roads, light railways, with regulations as to their use (with maps). Sign-posting of routes.

4. General location of ambulance park, triage and evacuation points for casualties, so far as it is practicable to prescribe them in advance. The division triage, at least, should if possible be fixed, and announced in Par. 4 of the field order.

5. Location of evacuation hospitals or points to which cases for these hospitals are to be evacuated.

6. Disposition of reserve units and transportation while awaiting assignment.

7. Liaison between sanitary units and with other troops, except such as is a matter of routine.

8. Duties of the provost marshal in connection with evacuation; collection of straggling wounded, salvage of arms and accouterments, taking charge of skulkers and others able to return to the front from all stations, guards at these stations, route marking, traffic regulations in connection with evacuation, liaison with medical service, or so much of these details as is not a matter of routine and custom.

9. Arrangements for the advance or withdrawal of the medical units according to the developments of the combat, so far as this is advisable or practicable in advance.

The plans of the army will include instructions as to the location of evacuation hospitals assigned to corps (or divisions), the assignment or use of other equipment pertaining to the army, arrangements for rail and water evacuation to the base, etc.

Ordinarily it will not be advisable nor practicable to prescribe all of these details in advance. In cases of formal attack or defense of an organized position it will usually be practicable to specify the routes of evacuation, the location of ambulance heads, and the general locality in which the field hospitals will be placed. In more open warfare it will often be inadvisable to prescribe these details in advance. Orders should not specify the particular units which are to occupy certain stations nor the exact location of the stations, such details being left to the medical authorities. For example, the order would state, "Field hospital for gas cases near _____."

Defense plans will specify the arrangements during periods of calm, and those to be adopted when combat is imminent.

The orders of smaller units (regiments and battalions) include so much of the following as is applicable or necessary:

1. Assignment of medical personnel and equipment, if not already fixed.

2. Location of aid stations of the unit.

3. Location of ambulance heads.

4. Location of the divisional triage and routes thereto.

5. Routes of evacuation within the sector of the unit, trenches, trails, roads.

6. Use of transportation moving to the rear for evacuation of wounded.

7. Collection of straggling wounded and skulkers within the area occupied by the organization.

8. Instructions as to the assignments of additional personnel as litter bearers.

9. Liaison in connection with evacuation.

CONCLUSION

The foregoing account of the functions and practice of the medical department in campaign is based upon the experiences of American troops in the World War. It may therefore be regarded as good practice. There can be, however, no rules of thumb nor rigid patterns for the operations of the medical department, just as there are none for other arms of the service. Peculiarities of terrain and variations in other conditions will require many modifications. The ever varying situations of the war of movement will call for widely varying tactics. The means must be adapted to the conditions and the purposes in view, and in an emergency, common sense, good judgment, initiative and experience must be relied upon to meet the situation.

APPENDIX "A"

SUMMARY OF HEALTH AND CASUALTY STATISTICS OF THE WORLD WAR

Of every 100 American soldiers who took part in the war two were killed or died of wounds or disease. Amongst the other nations which were engaged for a longer period the mortality was from 20% to 25% of all men called to the colors. This was the deadliest of wars.

The following table gives the battle deaths (killed or died of wounds) of the principal combatants:

Russia	1,700,000
Germany	1,600,000
France	1,385,000
Great Britain	900,000
Austria	800,000
Italy	364,000
Turkey	250,000
Servia and Montenegro	125,000
Belgium	102,000
Roumania	100,000
Bulgaria	100,000
United States	50,300
Greece	7,000
Portugal	2,000
Total	7,485,000

This number exceeds the total deaths from all causes in all wars in the preceding 100 years. American troops were in heavy combat only 200 days, which accounts for their relatively small number of casualties.

The battle deaths per 1,000 officers and per 1,000 men actually in France, by arm of the service, were as follows:

Arm of the Service	*Officers per 1,000*	*Men per 1,000*
Infantry and machine guns	80.5	51.7
Air Service	33.3	1.6
Engineers	11.5	6.5
Tank corps	11.5	5.4
Artillery	8.1	5.6
Signal corps	3.8	7.8
Medical department	1.7	1.9

The following table summarizes the battle casualties of the American Expeditionary Forces:

Killed	34,636	
Died of wounds and gas	14,907	
Total dead		49,543
Severely wounded	90,880	
Slightly wounded	80,480	
Wounded, degree undetermined	34,380	
Total wounded, including gassed		205,690
Total battle casualties		255,233

Twenty nine American divisions took an active part in the fighting and these divisions suffered practically all the losses.

The casualty statistics of these 29 divisions are as follows:

Average number of days in line for each division, "quiet sector"	46
Average number of days in line for each division, "active sector"	31
Average total days in line, per division	77
Average battle deaths, per division	1,628
Average battle casualties (killed and wounded) per division	8,454
Proportion of killed to wounded, about	1 to 4.2*
Average percentage of total strength of division, killed or wounded in average of 77 days in line	30
Maximum battle casualties suffered by any division (2nd regular)	22,230
Percentage of strength of division	80
Number of days this division was in line	137

The maximum weekly rate of battle deaths in the American Expeditionary Forces was 6,900 during the severest part of the Meuse-Argonne offensive, some 750,000 combatant troops being engaged. During 47 days of this, the greatest battle ever fought by American troops, and one of the greatest and bloodiest battles in history, the killed and wounded in the American army amounted to nearly 120,000 or almost exactly 16% of the combatant troops engaged. The average loss per day of this battle was thus about 0.34% of all combatants.

The records further show that of the wounded received in hospitals during the late war, 85% were eventually returned to full duty, certainly a proud record for the medical department.

The total number of admissions to the hospitals of the A. E. F. for all causes during the years 1917-1918, was 610,500.

* This is the ratio of killed or died of wounds to wounded who recovered. The proportion of actually killed in battle to wounded in battle (including those who died later from their wounds) was about 1 to 6.

The foregoing figures give an idea of the casualties that may be expected, and the demands upon the medical service under conditions such as those which obtained during the late war.

The total deaths in the army (including the Marine Corps) during the war were 115,660. Of these 79,610 or 69% occurred overseas, the remainder in the U. S. The causes of death were:

Battle	50,280	43%
Disease	57,460	50%
Accident	7,920	7%

This is the first war in which the U. S. has engaged where the number of deaths in battle has approached those due to disease. In the A. E. F. proper the number of deaths in battle exceeded those from disease. This does not mean that the battle deaths were high, but that those due to disease were low. The death rates from disease in some of our late wars are as follows (the figures are deaths per 1,000 men per year, and are hence comparable):

Mexican War	110
Civil War	65
Spanish War	26
World War	19

Thus the death rate from disease in the late war was only about one sixth that which obtained in the Mexican War.

The causes of this remarkable decrease in the death rate from disease are found in greatly improved preventive measures, chief amongst which are:

(a) Larger and more efficient medical personnel. There were 33,000 physicians and surgeons who held commissions during the war, 17% of all officers, or more than 8 for each 1,000 men in the army. The total strength of the Medical Department at the time of the armistice was about 300,000 or about 8% of the total strength. The results achieved prove beyond question that this large medical service was justified.

(b) Anti-typhoid prophylaxis administered to all men in the service. During the Spanish-American War 85% of all deaths were caused by typhoid fever. During the World War typhoid fever was practically eliminated, there being only 2,328 cases and 277 deaths from this cause in the U. S. Army.

(c) More attention given to and better facilities provided for all sanitary precautions, including sterilization of water, personal cleanliness, proper shelter and housing conditions, food, etc.

(d) Adequate hospital facilities. On Dec. 1, 1918 there were available 399,510 beds, or one for every nine men in the service. Of these 287,290 were overseas, and 112,220 in the U. S. Hospital facilities in the A. E. F. were at all times adequate. In the U. S. they were over-taxed only at the time of the great "flu" epidemic.

The high percentage of wounded returned to duty and the astonishingly low death rate from disease constitute one of the most splendid achievements of medical science, of which the profession may well be proud. It contributed powerfully to the victory over Germany.

The principal causes of death from disease in this war, in order of their importance, were as follows:

Pneumonia	83.6%
Meningitis	4.1%
Tuberculosis	2.3%
Empyemia	1.1%
Septicemia	0.6%
Bright's disease	0.5%
Peritonitis	0.5%
Typhoid fever	0.5%
Appendicitis	0.4%
Heart diseases	0.4%
Scarlet fever	0.3%
Measles	0.2%
All others	5.5%
	100.0%

The majority of the deaths from pneumonia occurred in the U. S. during the "flu" epidemic, September to November, 1918. Measles were very prevalent during the first year, and particularly dangerous as a fore-runner of pneumonia. These figures indicate that, at least from the point of view of national defense, the medical profession, having eliminated typhoid fever, should now give special attention to pneumonia.

The greatest contributors to the sick list, and the chief causes of ineffectiveness in the army, were the venereal diseases. Wonderful results were accomplished, however, in the control of these diseases. Investigations showed that 96% of all new cases at the large cantonments in the U. S. were contracted before the entry of the men into the service, and only 4% thereafter.

The number of cases of venereal disease in hospital per 10,000 men in the A. E. F. was reduced from 75 in November, 1917, to 9 in September, 1918. The number rose again to 40 after the armistice.

Amongst all men physically examined for induction into the service during the war about 16% were found to be totally unfit for any kind of service, and an additional 16% were physically unfit for active service in the field. Thus of every 100 young men in the U. S., 32 are not perfectly fit to take up the full duties of industrial life or to become husbands and fathers. Many of the remainder are not as fit as they should be. During the Great War about 50,000 Americans were killed in battle. During the same year 150,000 died in the U. S. from tuberculosis alone. Amongst 30,000,000 wage earners in the U. S. an average of 9 working days per year, or a total of 270,000,000 days of labor annually is lost through sickness, most of it preventable. Some 600,000 people die annually in the U. S. from preventable disease.

These facts, and the results obtained by the Medical Dept. in the prevention and cure of disease during the Great War, constitute one of the strongest arguments in favor of Universal Training for the youth of America. The opportunity it would afford the medical profession for the correction of bodily defects and bad habits in early youth, and the wholesale prevention of disease, would result in an improvement in the physical health, stamina and longevity of our people, which alone would be worth many times the cost of the training.

APPENDIX "B"

EXTRACT FROM ANNEX TO DIVISION ATTACK ORDER. SEE ALSO PLATE III

ANNEX NO. 3. 20th Div., 4th Army Corps,
CUISY
29 October 18, 8:30 a. m.

Field Order No. 16.

Maps: DUN sur MEUSE, 1/20,000
Special Map No. 5, 1/20,000

PLAN OF COMMUNICATION, SUPPLY AND EVACUATION

* * *

5. EVACUATION OF SICK AND WOUNDED AND ANIMALS

(a) *Ambulance heads.* After the capture of the 1st Objective, ambulance heads will be established near P—— and Q——.

(b) *Triage.* The divisional triage will be established near the cross-roads at X——, when directed by the division surgeon, but not earlier than H plus 2 hours on D day.

(c) *Sanitary train.* In preparation for the attack, units of the division sanitary train will be parked clear of the roads at F—— and G——, as directed by the division surgeon, by ——a. m. on D-1 day.

(d) *Evacuation hospitals.* The evacuation hospitals assigned to this division will be established near K——.

(e) *Additional equipment.* A mobile hospital and one company of light ambulances will be assigned to this division for the attack. They will be available at L—— after ——a. m. on D-1 day.

(f) *Routes of evacuation.* The axial road of the division is available as a route of evacuation, but adjacent routes will be used when possible, as indicated by the division A. P. M. (See Special Map No. 5.)

(g) *Animals.* Sick or wounded animals will be evacuated to N——.

* * *

The foregoing instructions include all that will be necessary in the average case of thoroughly trained troops, where routine is well established.

PLATE I

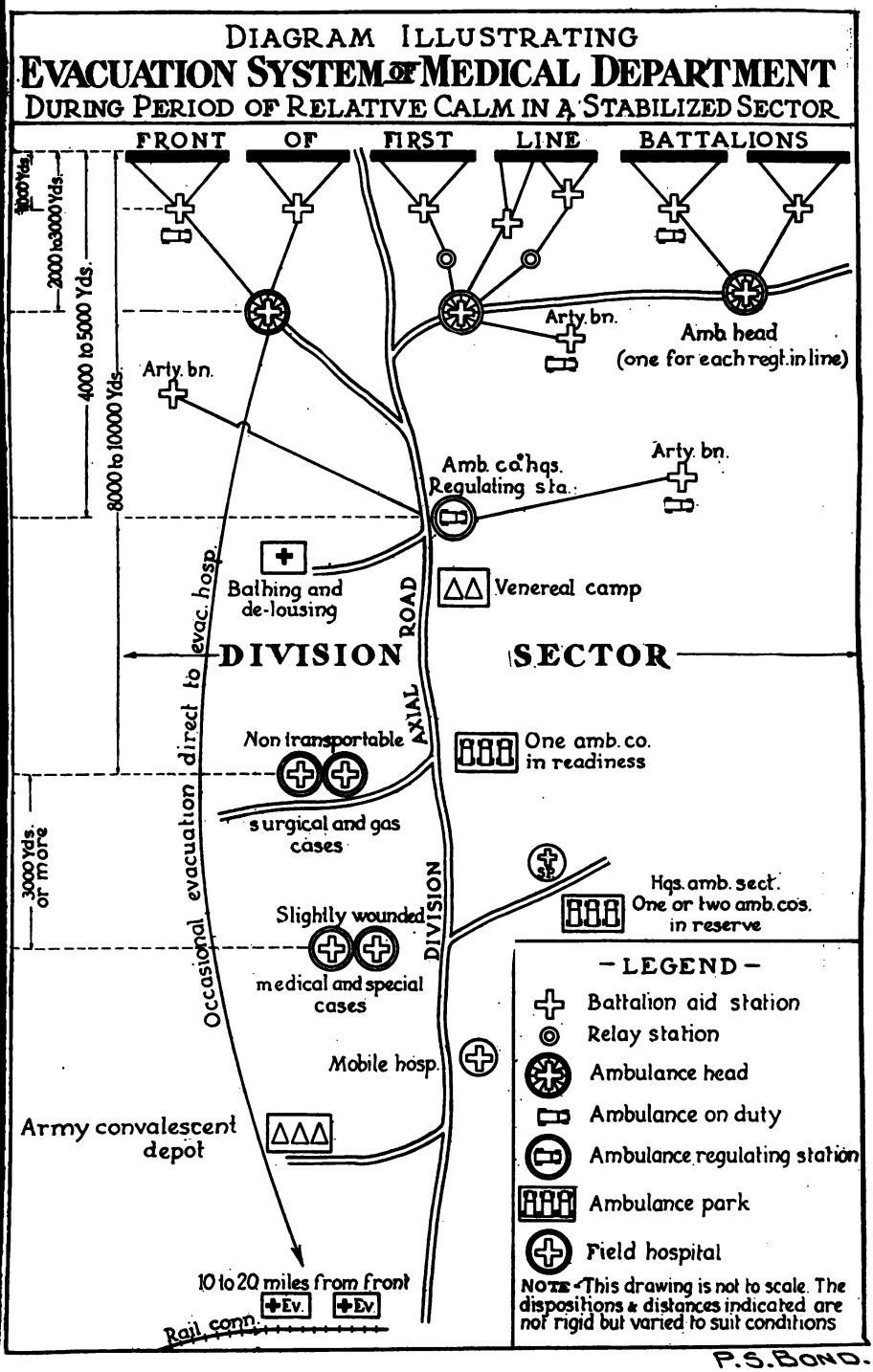


DIAGRAM ILLUSTRATING
EVACUATION SYSTEM OF MEDICAL DEPARTMENT
DURING PERIOD OF RELATIVE CALM IN A STABILIZED SECTOR
FRONT OF FIRST LINE BATTALIONS
1000 Yds.
2000 to 3000 Yds.
4000 to 5000 Yds.
8000 to 10000 Yds.
Arty. bn.
Arty. bn.
Amb head
(one for each regt. in line)
Arty. bn.
Amb. co. hqs.
Regulating sta.
Bathing and de-lousing
Venereal camp
DIVISION
SECTOR
ROAD
AXIAL
DIVISION
Occasional evacuation direct to evac. hosp.
Non transportable
surgical and gas cases
One amb. co. in readiness
3000 Yds. or more
Hqs. amb. sect.
One or two amb. cos. in reserve
Slightly wounded
medical and special cases
Mobile hosp.
Army convalescent depot
10 to 20 miles from front
Ev.
Ev.
Rail conn.
LEGEND
Battalion aid station
Relay station
Ambulance head
Ambulance on duty
Ambulance regulating station
Ambulance park
Field hospital
NOTE - This drawing is not to scale. The dispositions & distances indicated are not rigid but varied to suit conditions
P.S. BOND.

PLATE II

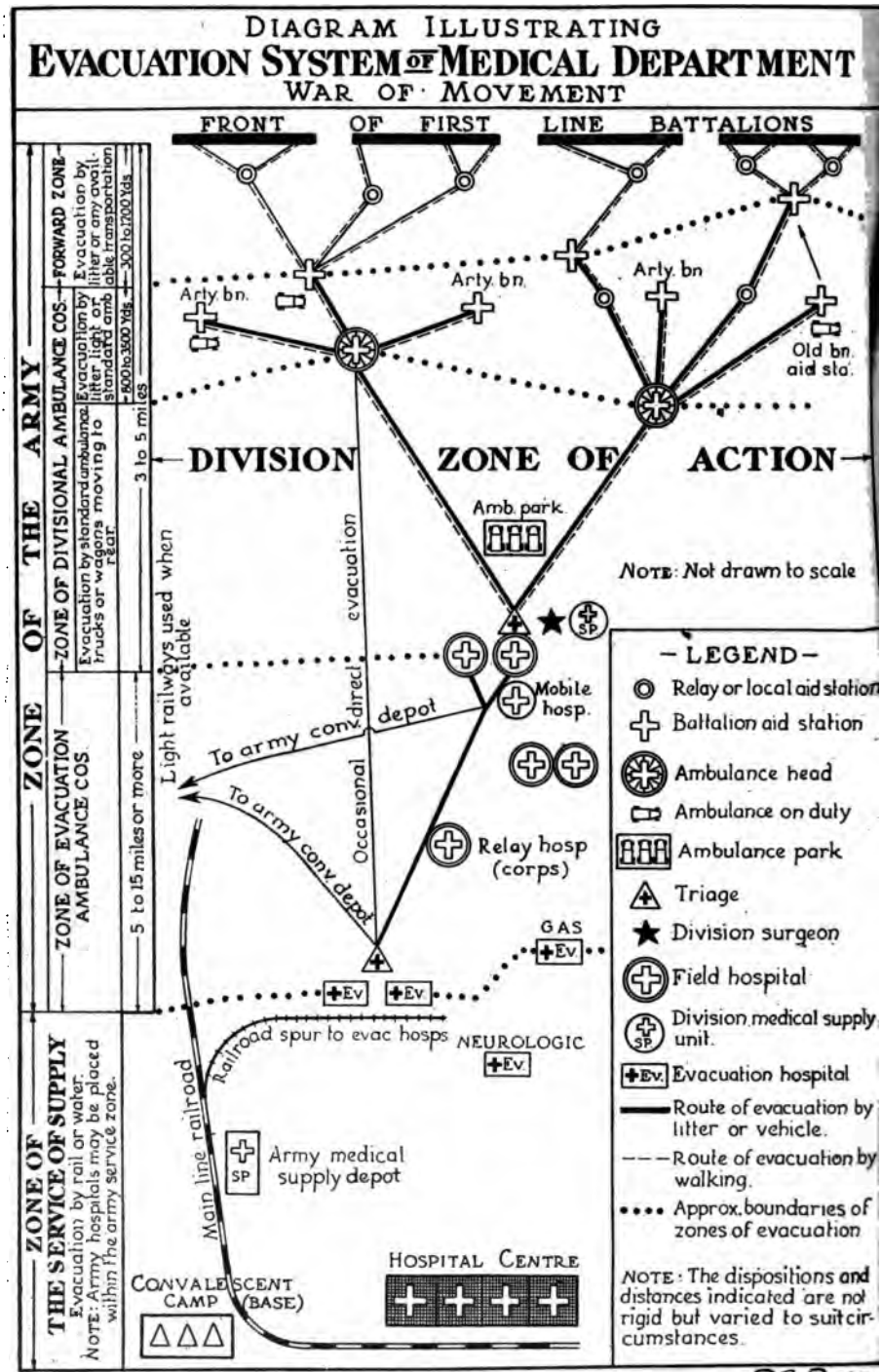
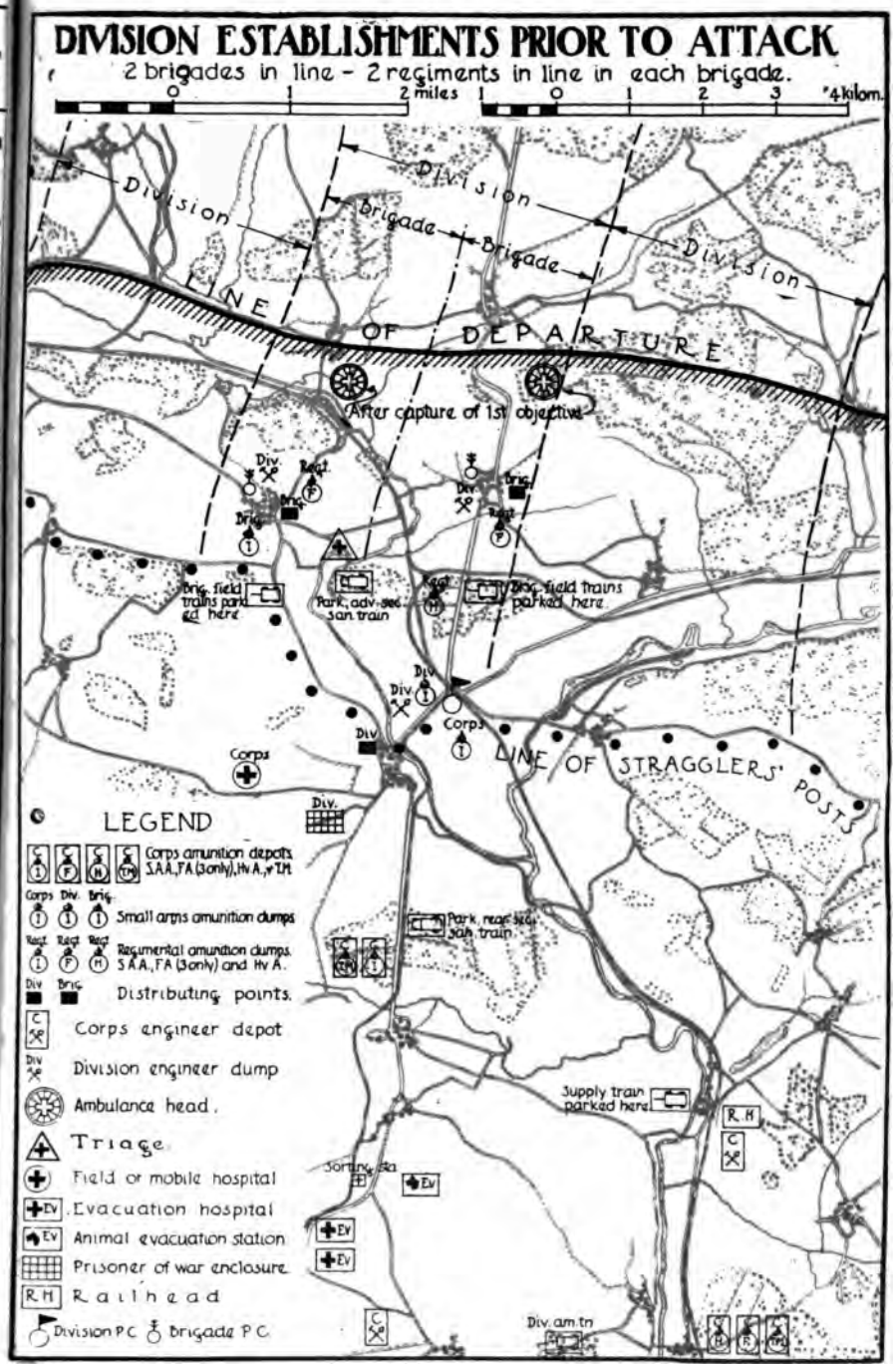
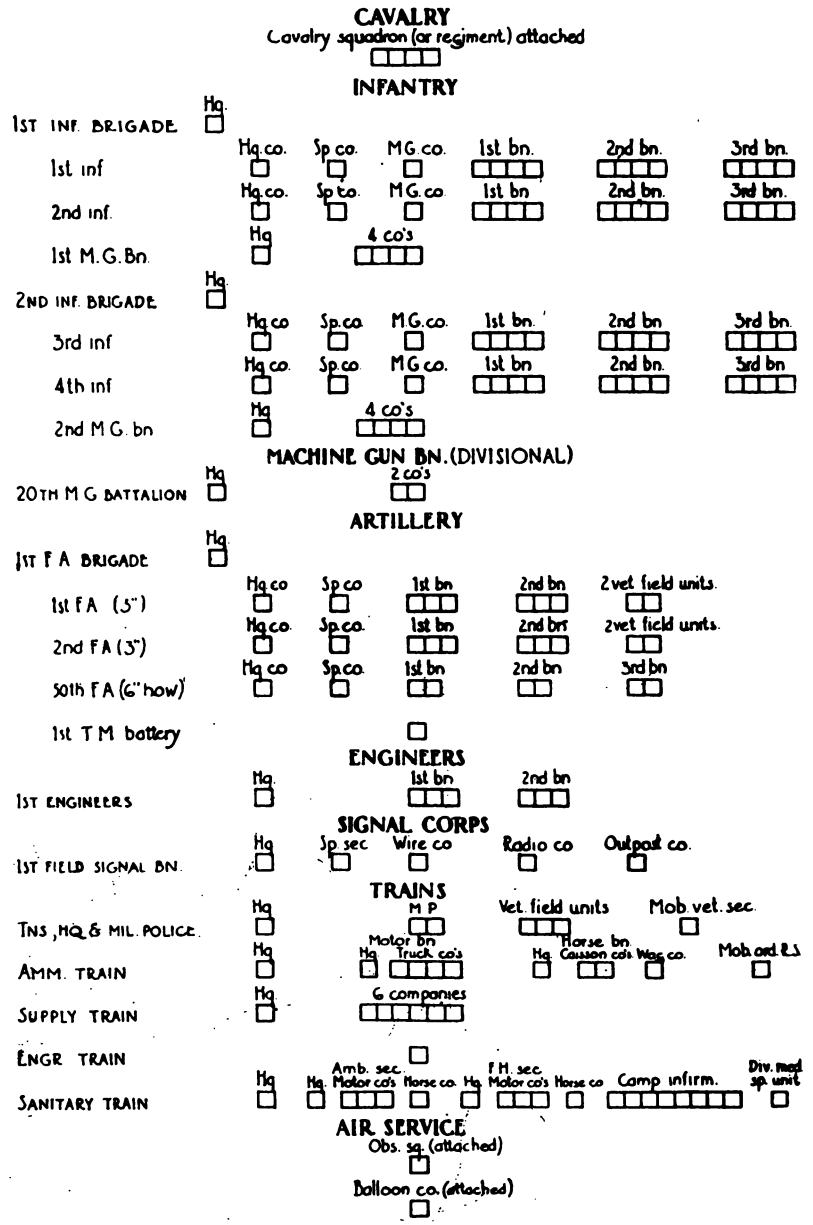


DIAGRAM ILLUSTRATING
EVACUATION SYSTEM OF MEDICAL DEPARTMENT
WAR OF MOVEMENT
FRONT OF FIRST LINE BATTALIONS
ZONE OF THE ARMY
ZONE OF DIVISIONAL AMBULANCE COS
FORWARD ZONE
Evacuation by litter or any available transportation
300 to 1200 Yds
Evacuation by litter light or standard amb
800 to 3000 Yds
Evacuation by standard ambulance
Evacuation by trucks or wagons moving to rear
3 to 5 miles
ZONE OF EVACUATION AMBULANCE COS
5 to 15 miles or more
ZONE OF THE SERVICE OF SUPPLY
Evacuation by rail or water.
NOTE: Army hospitals may be placed within the army service zone.
Arty bn.
Arty bn.
Arty bn
Old bn. aid sta.
DIVISION ZONE OF ACTION
Amb. park
NOTE: Not drawn to scale
Light railways used when available
direct evacuation
depot
To army conv
To army conv depot
Occasional
Mobile hosp.
Relay hosp (corps)
GAS
Ev
Ev
Ev
Railroad spur to evac hosps
NEUROLOGIC
Ev
Main line railroad
SP
Army medical supply depot
HOSPITAL CENTRE
CONVALESCENT CAMP (BASE)
LEGEND
Relay or local aid station
Battalion aid station
Ambulance head
Ambulance on duty
Ambulance park
Triage
Division surgeon
Field hospital
Division medical supply unit.
Ev. Evacuation hospital
Route of evacuation by litter or vehicle.
Route of evacuation by walking.
Approx. boundaries of zones of evacuation
NOTE: The dispositions and distances indicated are not rigid but varied to suit circumstances.
P.S. BOND.


DIVISION ESTABLISHMENTS PRIOR TO ATTACK
2 brigades in line - 2 regiments in line in each brigade.
0 1 2 miles
0 1 2 3 4 kilom.
Division
Brigade
Brigade
Division
LINE OF DEPARTURE
After capture of 1st objective
Brig. field trains parked here
Park, adv. sec. san. train
Brig. field trains parked here
Corps
LINE OF STRAGGLERS' POSTS
Park, rear sec. san. train
Supply train parked here
R.H
Sorting Sta
Div. am. tn
LEGEND
Corps ammunition depots. S.A.A., F.A. (3 only), Hv A., & T.M.
Small arms ammunition dumps
Regimental ammunition dumps. S.A.A., F.A. (3 only) and Hv A.
Distributing points.
Corps engineer depot
Division engineer dump
Ambulance head.
Triage.
Field or mobile hospital
Evacuation hospital
Animal evacuation station
Prisoner of war enclosure.
Railhead
Division P.C. Brigade P.C.

P.S. Bond

ORGANIZATION OF INFANTRY DIVISION


CAVALRY
Cavalry squadron (or regiment) attached
INFANTRY
1ST INF. BRIGADE
Hq.
1st inf
Hq.co. Sp.co. M.G.co. 1st bn. 2nd bn. 3rd bn.
2nd inf.
Hq.co. Sp.co. M.G.co. 1st bn. 2nd bn. 3rd bn.
1st M.G.Bn.
Hq 4 co's
2ND INF. BRIGADE
Hq.
3rd inf
Hq.co Sp.co. M.G.co. 1st bn. 2nd bn 3rd bn.
4th inf
Hq.co. Sp.co. M.G.co. 1st bn 2nd bn. 3rd bn
2nd M.G. bn
Hq 4 co's
MACHINE GUN BN. (DIVISIONAL)
20TH M.G. BATTALION
Hq 2 co's
ARTILLERY
1ST F.A. BRIGADE
Hq.
1st F.A. (3")
Hq.co Sp.co 1st bn 2nd bn 2 vet field units.
2nd F.A. (3")
Hq.co. Sp.co. 1st bn 2nd bn 2 vet field units.
50th F.A. (6" how)
Hq.co Sp.co. 1st bn 2nd bn 3rd bn
1st T.M. battery
ENGINEERS
1ST ENGINEERS
Hq. 1st bn 2nd bn
SIGNAL CORPS
1ST FIELD SIGNAL BN.
Hq Sp.sec Wire co Radio co Outpost co.
TRAINS
TNS, HQ & MIL. POLICE.
Hq M.P. Vet. field units Mob. vet. sec.
AMM. TRAIN
Hq Motor bn Hq Truck co's Hq Horse bn Caisson co's Wag co. Mob. ord. R.S.
SUPPLY TRAIN
Hq 6 companies
ENGR. TRAIN
SANITARY TRAIN
Hq Hq Amb. sec. Motor co's Horse co. Hq F.H. sec. Motor co's Horse co Camp infirm. Div. med. sp. unit
AIR SERVICE
Obs. sq. (attached)
Balloon co. (attached)

P.S. Bonc

PLATE V

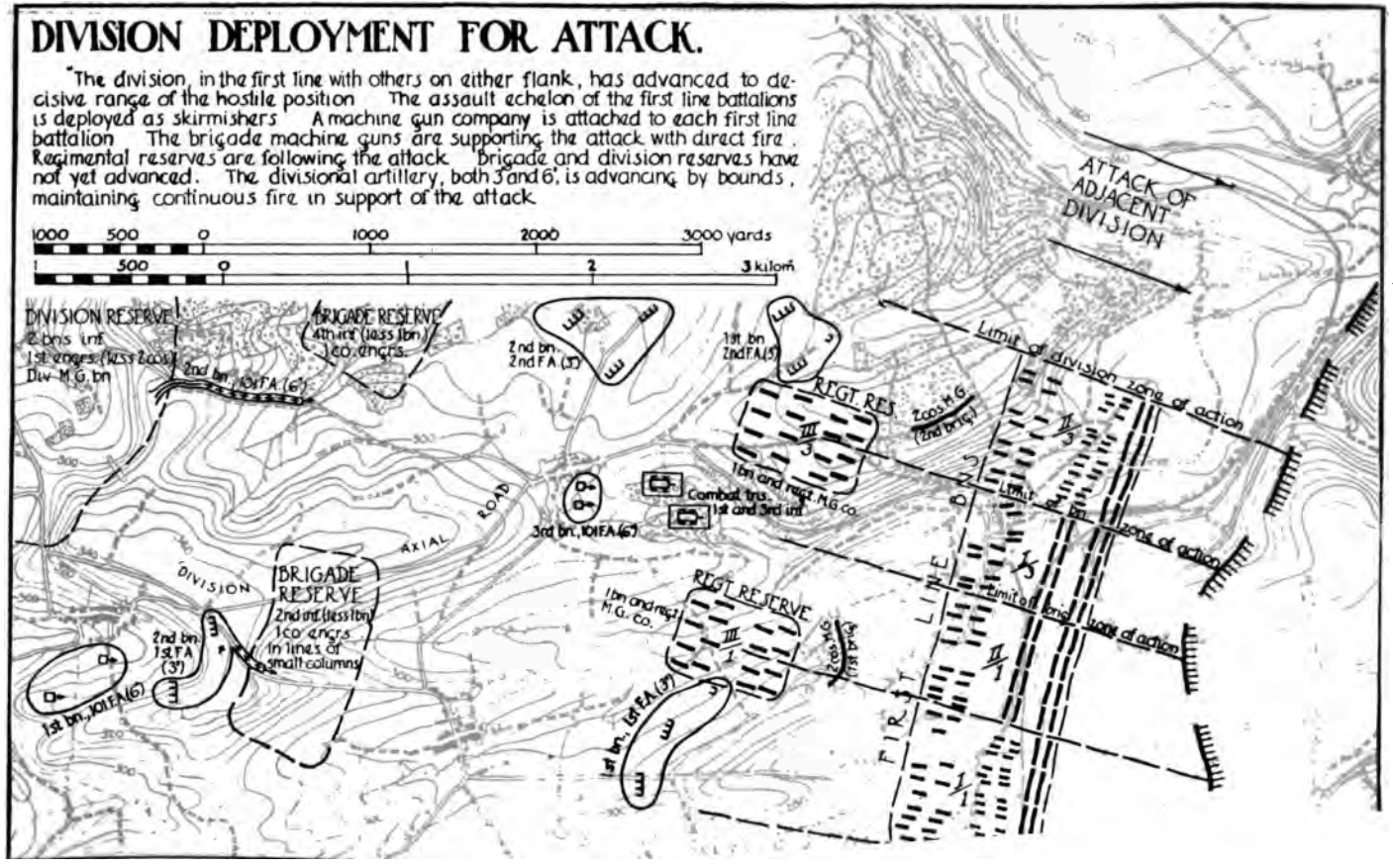
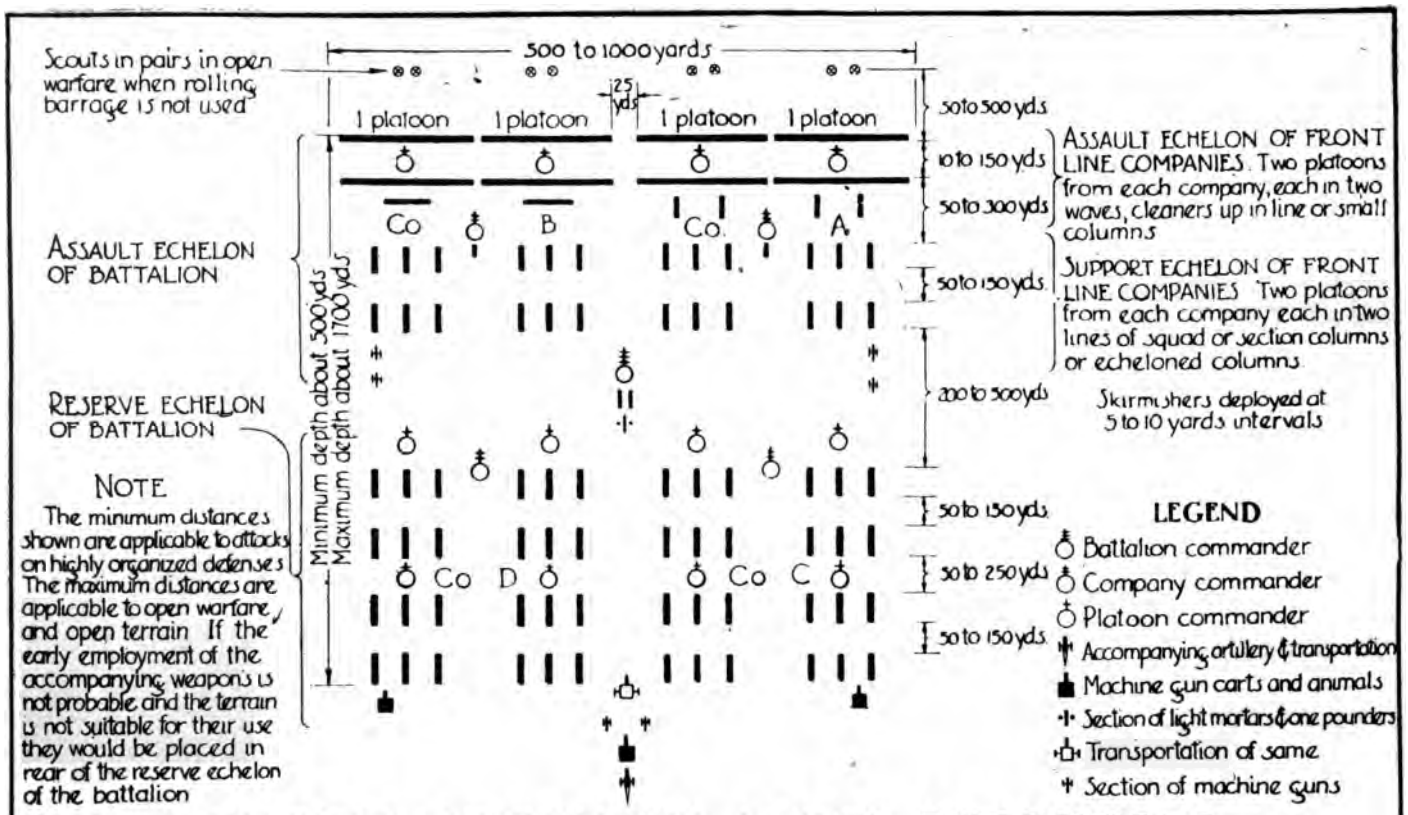

DIVISION DEPLOYMENT FOR ATTACK.
"The division, in the first line with others on either flank, has advanced to decisive range of the hostile position. The assault echelon of the first line battalions is deployed as skirmishers. A machine gun company is attached to each first line battalion. The brigade machine guns are supporting the attack with direct fire. Regimental reserves are following the attack. Brigade and division reserves have not yet advanced. The divisional artillery, both 3" and 6", is advancing by bounds, maintaining continuous fire in support of the attack.
1000 500 0 1000 2000 3000 yards
1 500 0 2 3 kilom
DIVISION RESERVE
2 bns inf.
1st engrs (less 2 cos)
Div M.G. bn
2nd bn, 10th F.A. (6")
BRIGADE RESERVE
4th inf (less 1 bn)
1 co. engrs.
2nd bn, 2nd F.A. (3")
1st bn 2nd F.A. (3")
ATTACK OF ADJACENT DIVISION
Limit of division zone of action
REGT RES
2 cos M.G. (2nd brig.)
1 bn and regt M.G. co.
Combat trns. 1st and 3rd inf.
3rd bn, 10th F.A. (6")
AXIAL ROAD
DIVISION
BRIGADE RESERVE
2nd inf (less 1 bn)
1 co. engrs
in lines of small columns
2nd bn, 1st F.A. (3")
1st bn., 10th F.A. (6")
REGT RESERVE
1 bn and regt M.G. co.
2 cos M.G. (1st brig.)
1st bn, 1st F.A. (3")
FIRST LINE
Limit of bn zone of action
Limit of bn zone of action

PLATE VI


Scouts in pairs in open warfare when rolling barrage is not used
500 to 1000 yards
25 yds
1 platoon
1 platoon
1 platoon
1 platoon
50 to 500 yds
10 to 150 yds
50 to 300 yds
ASSAULT ECHELON OF FRONT LINE COMPANIES. Two platoons from each company, each in two waves, cleaners up in line or small columns
Co
B
Co.
A
ASSAULT ECHELON OF BATTALION
Minimum depth about 500 yds
Maximum depth about 1700 yds
50 to 150 yds
SUPPORT ECHELON OF FRONT LINE COMPANIES. Two platoons from each company each in two lines of squad or section columns or echeloned columns
200 to 500 yds
Skirmishers deployed at 5 to 10 yards intervals
RESERVE ECHELON OF BATTALION
50 to 150 yds
50 to 250 yds
50 to 150 yds
Co
D
Co
C
NOTE
The minimum distances shown are applicable to attacks on highly organized defenses The maximum distances are applicable to open warfare and open terrain If the early employment of the accompanying weapons is not probable and the terrain is not suitable for their use they would be placed in rear of the reserve echelon of the battalion
LEGEND
Battalion commander
Company commander
Platoon commander
Accompanying artillery & transportation
Machine gun carts and animals
Section of light mortars & one pounders
Transportation of same
Section of machine guns

EXAMPLES OF INFANTRY ATTACK DISPOSITIONS

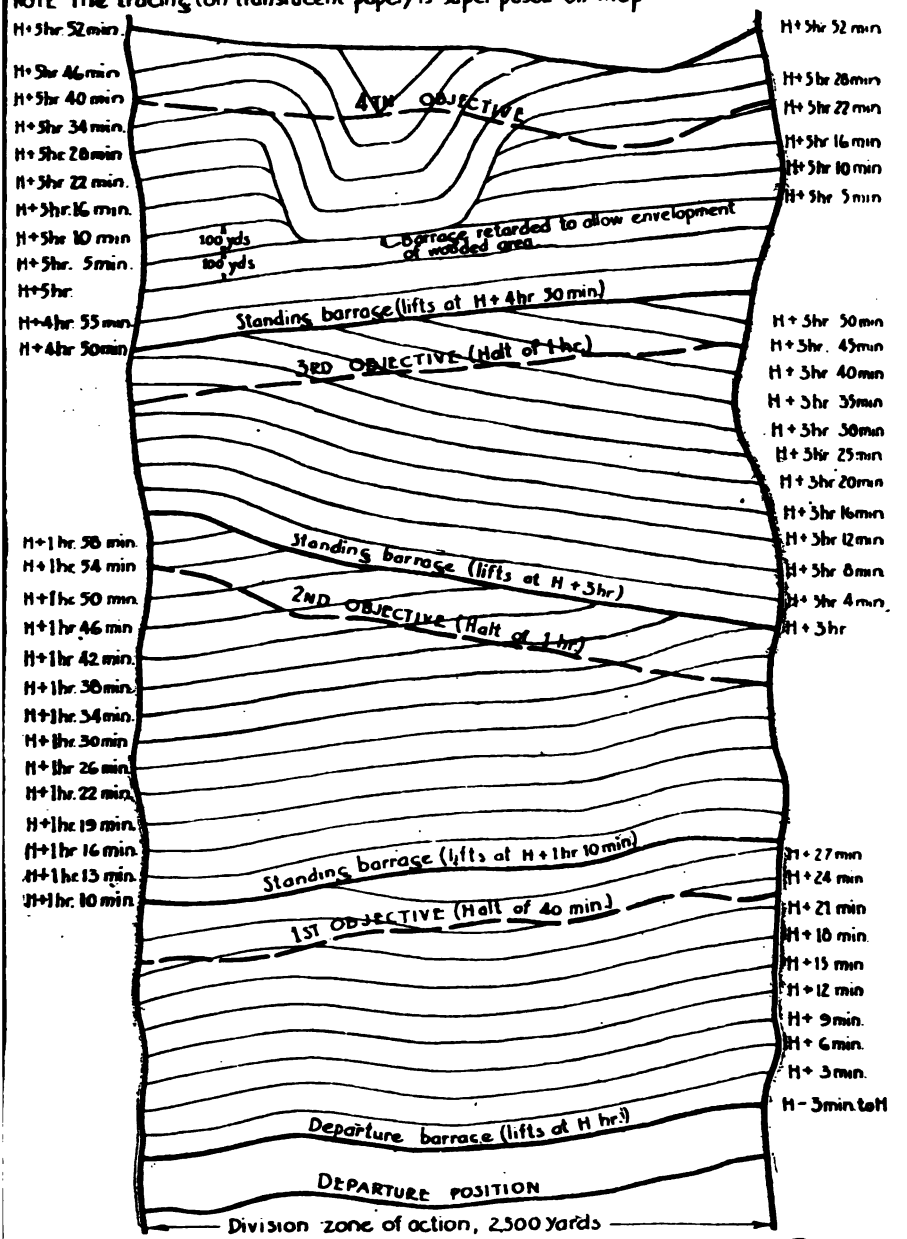
ATTACK FORMATION OF A FRONT LINE BATTALION

PLATE VII

ARTILLERY ROLLING BARRAGE IN ATTACK

GRAPHIC TIME TABLE SHOWING TIMES AT WHICH 3" GUN BARRAGE LIFTS FROM LINES INDICATED

NOTE The tracing (on translucent paper) is super-posed on map



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ARTILLERY DEFENSIVE BARRAGE SCHEMES

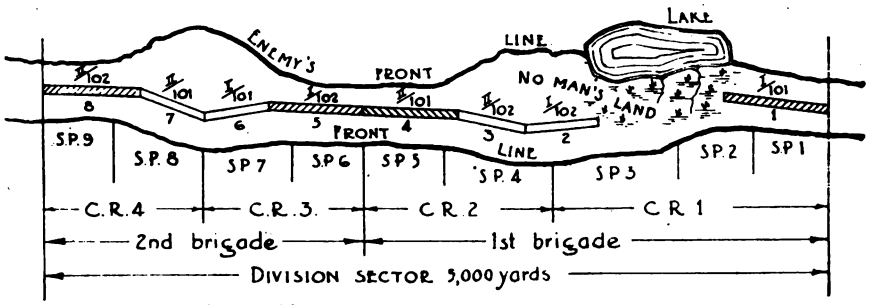


FIG. 1 NORMAL AND CONTINGENT BARRAGE ON A DIVISION FRONT.

1ST SITUATION

LEGEND

S.P.	Strong point.
C.R.	Center of resistance
▬▬	Normal barrage.
▭	Contingent or superposed barrage.
I/102	2nd bn 102nd F.A (3in), etc.

NOTE

In case of raids or local attacks a barrage is laid on any portion of the front. In case of a general attack only the normal barrage with density of 1 gun per 50 yards front, is employed opposite most dangerous portions.

2ND SITUATION

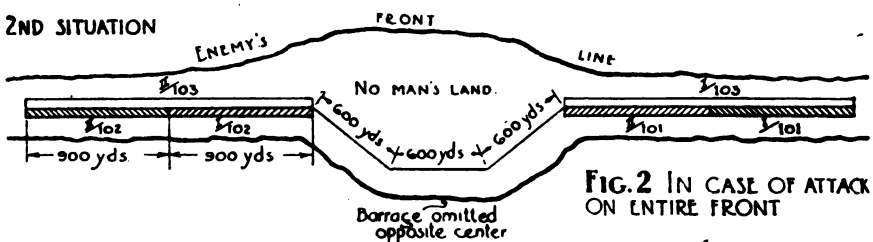


FIG. 2 IN CASE OF ATTACK ON ENTIRE FRONT

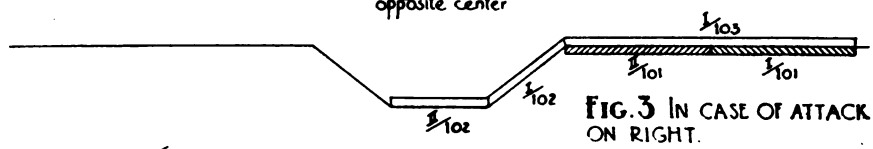


FIG. 3 IN CASE OF ATTACK ON RIGHT.

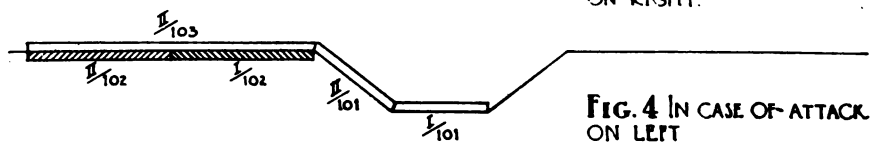


FIG. 4 IN CASE OF ATTACK ON LEFT

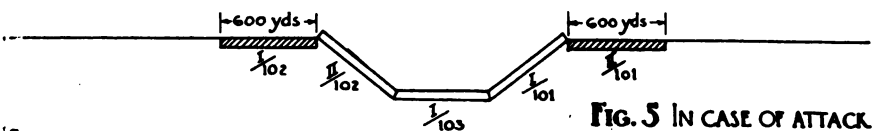
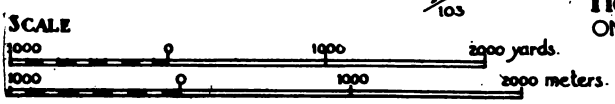


FIG. 5 IN CASE OF ATTACK ON CENTER.



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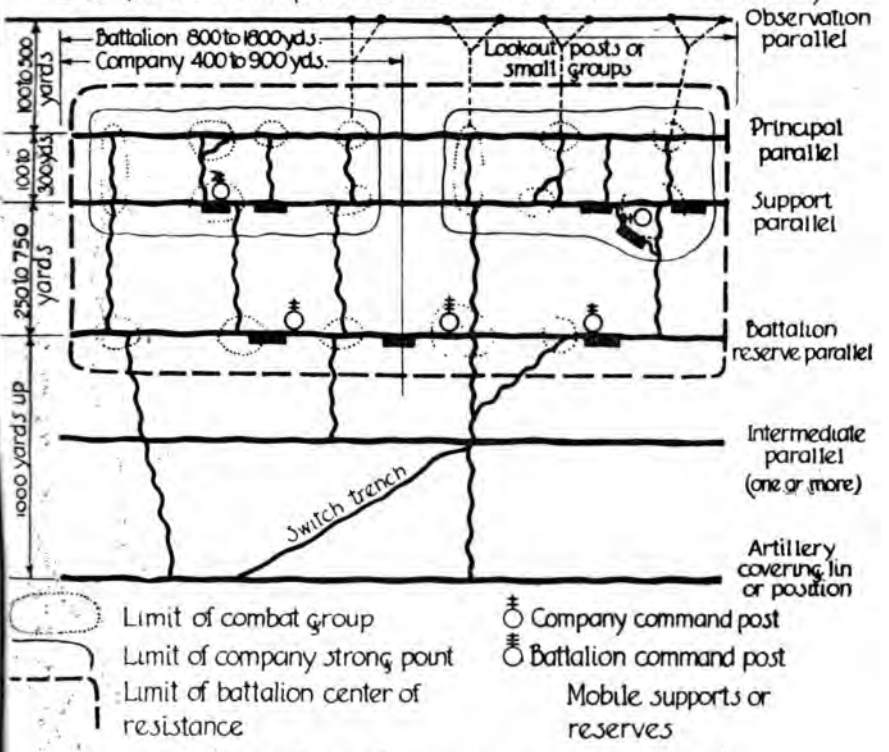
DIAGRAMS OF DEFENSIVE ORGANIZATION

FIG. 1 RIGHT LINE DIAGRAM OF A DEFENSIVE POSITION
Showing typical relation of parallels, approaches and defensive areas; and an example of the distribution of a battalion of infantry



(NOTE: These figures are not drawn to scale)

FIG. 2 RELATION OF SUCCESSIVE POSITIONS ON AN ORGANIZED FRONT

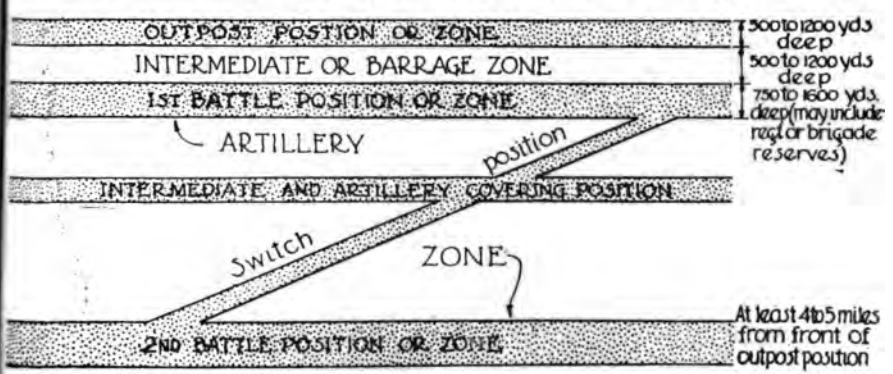

OUTPOST POSITION OR ZONE
INTERMEDIATE OR BARRAGE ZONE
1ST BATTLE POSITION OR ZONE
ARTILLERY position
INTERMEDIATE AND ARTILLERY COVERING POSITION
Switch ZONE
2ND BATTLE POSITION OR ZONE
500 to 1200 yds deep
500 to 1200 yds deep
750 to 1600 yds. deep (may include regt or brigade reserves)
At least 4 to 5 miles from front of outpost position

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PLATE X

DIAGRAM SHOWING METHOD OF INCORPORATING NATURAL FEATURES OF THE TERRAIN (VILLAGES, WOODS, HILLS, ETC.) IN DEFENSIVE POSITIONS

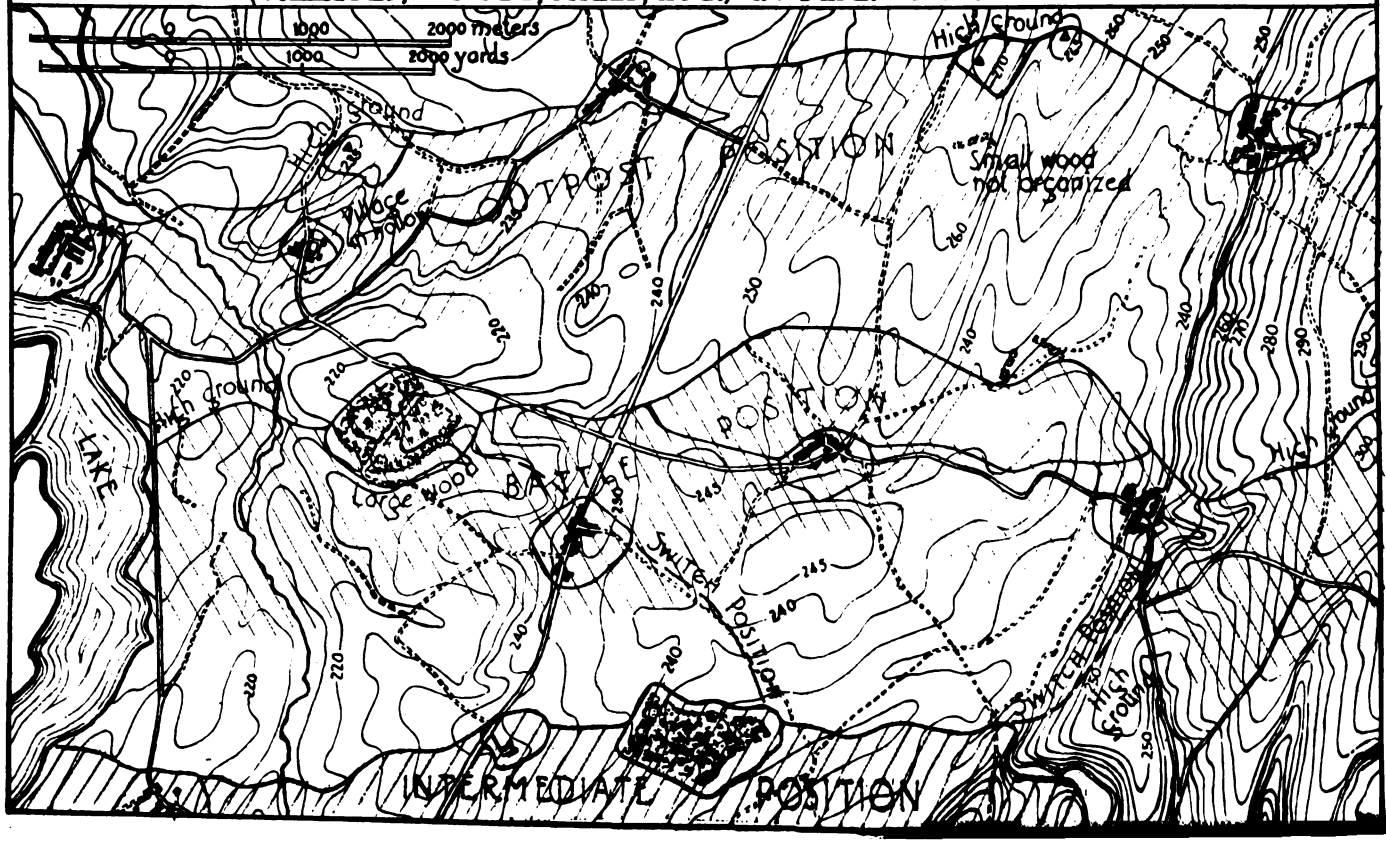
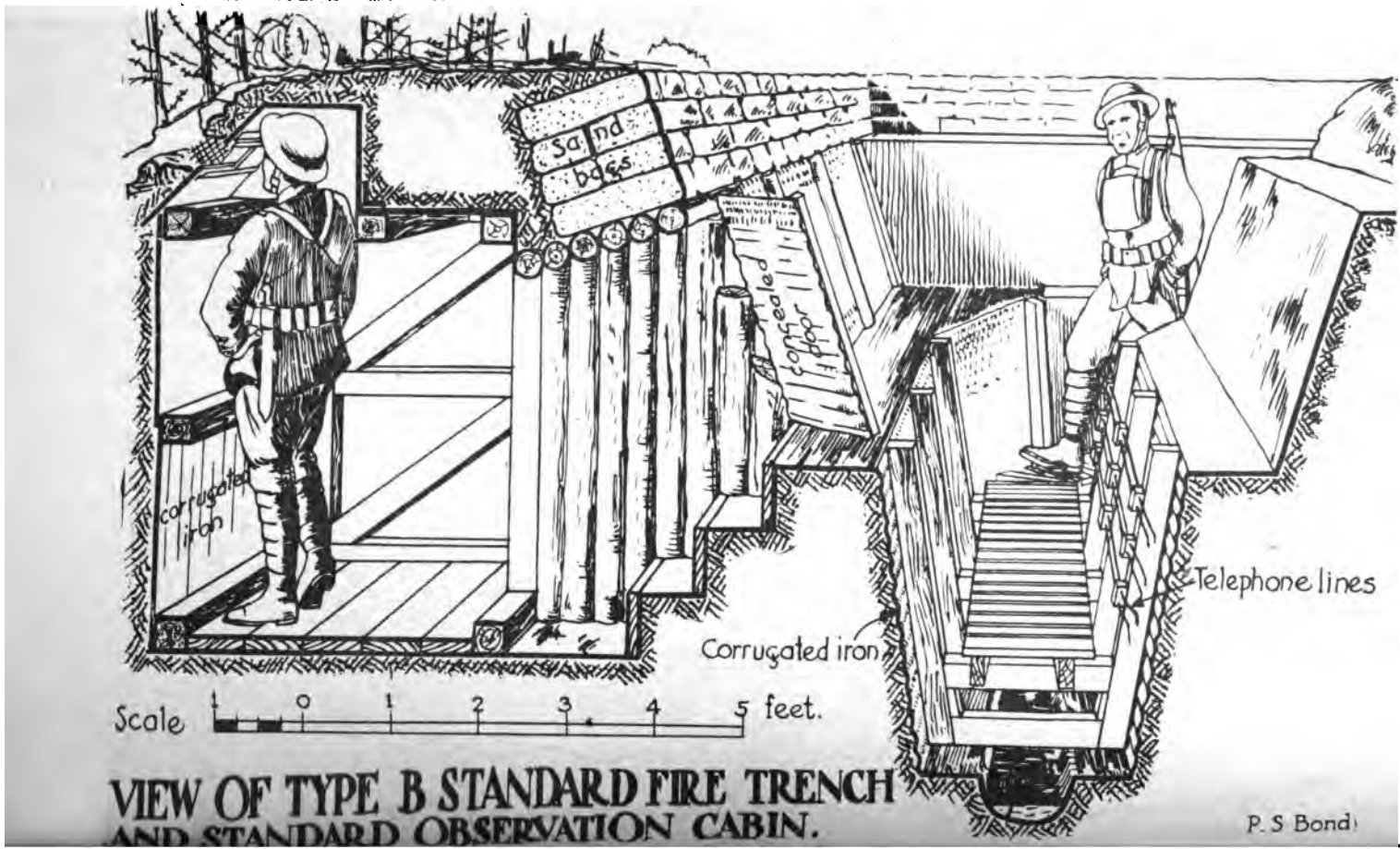


PLATE XI



VIEW OF TYPE B STANDARD FIRE TRENCH AND STANDARD OBSERVATION CABIN.

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SERVICE OF SUPPLY

DIAGRAM ILLUSTRATING METHOD OF FOOD SUPPLY IN STABILIZED WARFARE

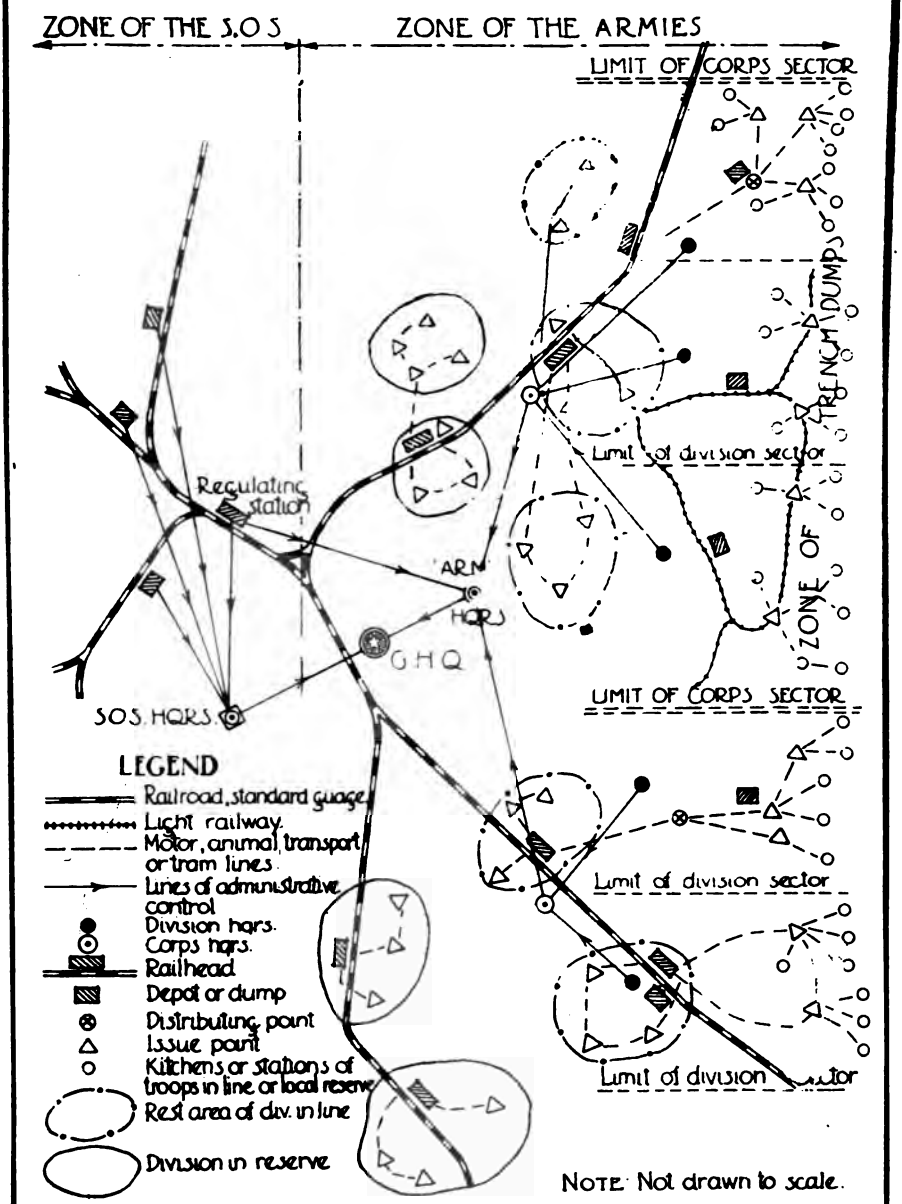
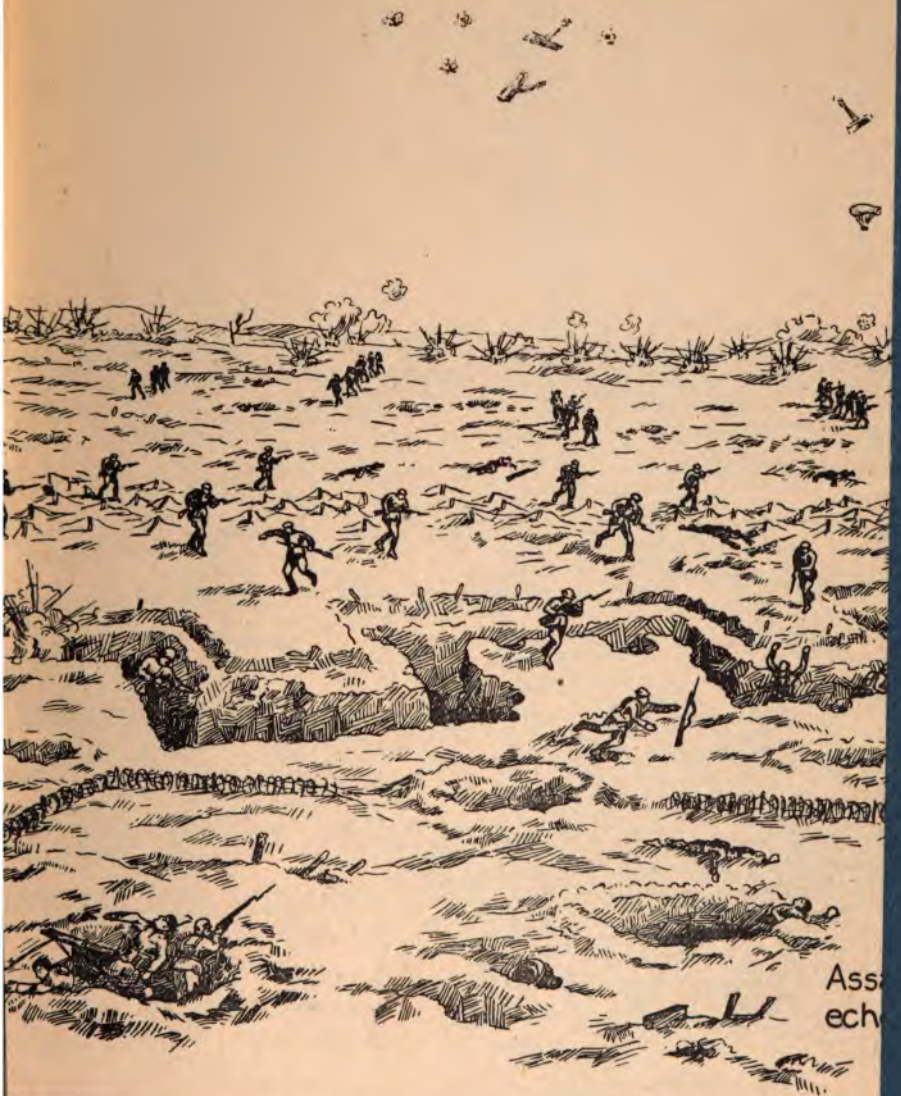
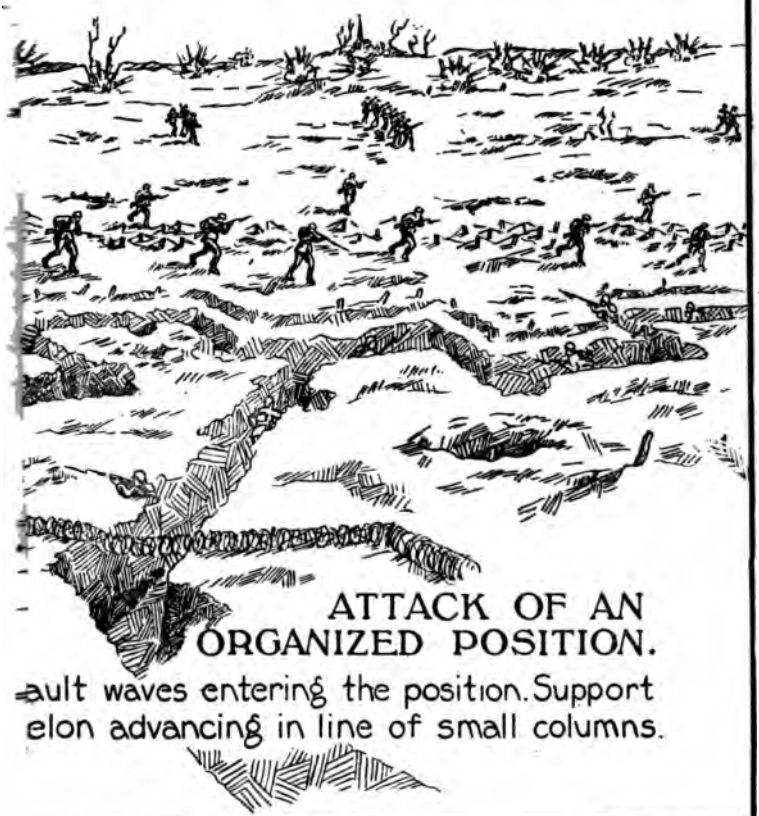


PLATE XIV





ATTACK OF AN ORGANIZED POSITION.

ault waves entering the position. Support
elon advancing in line of small columns.

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71 Medical service in
920 war.
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